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TRANSCRIPT OF RECORD.

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1908.

No. 66.

E EXPANDED METAL COMPANY AND HENRY CHESS,
ALTER CHESS, AND HARVEY B. CHESS, COPART-
NERS AS CHESS BROTHERS, PETITIONERS,

vs.

ERT B. BRADFORD, JOSEPH O. MILLECHAMP, N. J.
SCHMUCKER, JR., AND N. J. SCHMUCKER.

WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT
OF APPEALS FOR THE THIRD CIRCUIT.

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(20,678.)

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1907.

No. 289.

THE EXPANDED METAL COMPANY AND HENRY CHESS, WALTER CHESS, AND HARVEY B. CHESS, COPARTNERS AS CHESS BROTHERS, PETITIONERS,

vs.

EUGENE S. BRADFORD, JOSEPH C. MILLICHAMP, N. J. SCHMUCKER, JR., AND N. J. SCHMUCKER.

ON WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE THIRD CIRCUIT.

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a *Transcript of Record.*

United States Circuit Court of Appeals for the Third Circuit, October Term, 1905.

No. —.

EUGENE S. BRADFORD, JOSEPH C. MILLICHAMP, N. J. SCHMUCKER, JR., and N. J. SCHMUCKER, Respondents-Appellants,

vs.

THE EXPANDED METAL COMPANY and HENRY CHESS, WALTER CHESS, and HARVEY B. CHESS, Co-partners, Trading as Chess Brothers, Complainants-Appellees.

Appeal from the Circuit Court of the United States for the Eastern District of Pennsylvania.

Filed May 5, 1905.

i April Session, 1903.

Patent.

14.

THE EXPANDED METAL COMPANY and HENRY CHESS, WALTER CHESS, and HARVEY B. CHESS, Co-partners, Trading as Chess Brothers,

vs.

EUGENE S. BRADFORD, JOSEPH C. MILLICHAMP, N. J. SCHUMCKER, JR., and N. J. SCHUMCKER.

E. H. Hunter, E. Hayward Fairbanks.

1903, April 30.—Bill of complaint filed. Subpœna issued, returnable first Monday of June next.

1903, June 1.—E. H. Fairbanks, Esq., appears for defendants.

1903, June 3.—Subpœna returned served.

1903, July 3.—Bond for costs in sum of two hundred and fifty dollars filed.

1903, July 6.—Demurrer filed.

1903, July 8.—Confession to demurrer filed. Amendment to bill of complaint filed.

1903, Aug. 3.—Answer filed.

1903, Oct. 12.—Printed copy of answer filed.

1904, May 25.—Motion for order directing def't to close proofs filed. Affidavit of George Lewis Cooper on behalf of def't filed. Order of court directing def't to close proofs within sixty days from this date.

1904, Aug. 26.—Stipulation as to time for closing proofs and placing cause on Oct. Sess., 1904, list filed.

1904, Sept. 21.—Defendants' proofs filed.

1904, Dec. 14.—Notice of motion to strike case from calendar, &c., filed. *Eo die.* Motion granted.

1904, Dec. 14.—Order setting case for argument on January 10, 1905.

1905, January 10.—Complainants' record filed.

1905, January 10.—Respondents' record filed. Argued sur pleadings and proofs.

1905, March 30.—Opinion sustaining bill and awarding a perpetual injunction.

1905, April 6.—Decree for perpetual injunction, &c.

ii 1905, April 12.—Order refusing motion to suspend injunction.

1905, April 15.—Injunction issued.

1905, April 17.—Injunction returned served as to N. J. Schmucker, Jr., and Nicholas J. Schmucker. Not found as to E. S. Bradford and J. C. Millichamp.

1905, April 18.—Assignments of error filed. Petition for appeal filed. Order allowing appeal. Citation allowed and issued.

1905, April 20.—Injunction returned served as to Eugene S. Bradford.

1905, April 24.—Citation returned service accepted.

1905, April 28.—Bond sur appeal in sum of $500 approved and filed.

1905, May 3.—Præcipe for record sur appeal filed.

In the United States Circuit Court for the Eastern District of Pennsylvania. In Equity.

April Sess., 1903.

No. 14.

THE EXPANDED METAL COMPANY and HENRY CHESS, WALTER CHESS, and HARVEY CHESS, Co-partners, Trading as Chess Brothers,

vs.

EUGENE S. BRADFORD, JOSEPH C. MILLICHAMP, N. J. SCHUMCKER, JR., and N. J. SCHUMCKER.

Pleas and Proceedings before the Honorable the Judges of the Circuit Court of the United States for the Eastern District of Pennsylvania.

It is thus contained:

Be it remembered that on the thirtieth day of April, A. D. 1903, came the complainants by their counsel, E. H. Hunter, Esq., and filed their bill of complaint against the respondents, which, being read, is in the following words and figures, to wit:

POOR COPY

UNITED STATES, *Eastern District of Pennsylvania, sct:*

The President of the United States to Eugene S. Bradford, Joseph C. Millichamp, N. J. Schmucker, Jr., and N. J. Schmucker:

iii For certain causes offered before the Circuit Court of the United States in and for the Eastern District of Pennsylvania, in the Third Circuit, we command and strictly enjoin you, and each of you, that laying all other matters aside and notwithstanding any excuse, you and each of you personally be and appear before the Judges of the said Court, at a session of the same Court to be holden at Philadelphia, on the first Monday of June next to answer concerning those things which shall then and there be objected against you, and to do further and receive what the said Court shall have considered in this behalf. And have you then there this writ. And this you are in nowise to omit, under the penalty of four hundred dollars.

Witness the Honorable Melville W. Fuller, Chief Justice of the Supreme Court of the United States, at Philadelphia, this 30th day of April, 1903, and in the one hundred and twenty-seventh year of the Independence of the said United States.

(Signed) SAMUEL BELL,
[SEAL.] *Clerk Circuit Court, U. S.*

NOTE.—The defendants in this case are required to enter their appearance in the Clerk's Office of said Court on or before the first Monday of June next, otherwise this bill may be taken *pro confesso.*

April 30th, 1903. At Philadelphia, in my District, served the within writ on N. J. Schumeker, Jr., and N. J. Schumeker, and on May 1st, 1903, on Eugene Bradford and Joseph C. Millichamp, by giving to each respectively a true and attested copy of the same and making the contents known to them.

So answers

JOHN B. ROBINSON,
U. S. Marshal,
Per PETER D. HELMS, *Deputy.*

Endorsed: No. 14. Circuit Court. April Session, 1903. The Expanded Metal Company and Henry Chess, Walter Chess and Harvey B. Chess, co-partners, trading as Chess Brothers, *vs.* Eugene S. Bradford *et al.* Subpœna in Equity. Filed June 2, 1903. Samuel Bell, T. Clerk. Returnable on the First Monday of June next. E. H. Hunter, Solicitor for Complainant.

1 In the Circuit Court of the United States, Eastern District of Pennsylvania. In Equity.

April Session, 1903. No. —.

THE EXPANDED METAL COMPANY and HENRY CHESS, WALTER CHESS, and HARVEY B. CHESS, Copartners, Trading as Chess Brothers,

vs.

EUGENE S. BRADFORD, JOSEPH C. MILLICHAMP, N. J. SCHMUCKER, JR., and N. J. SCHMUCKER.

To the Honorable the Judges of the Circuit Court of the United States in and for the Eastern District of Pennsylvania:

The Expanded Metal Company, a corporation organized and existing under the laws of the State of Missouri, and maintaining an office at Saint Louis in said State and also at Chicago in the State of Ilinois, and a citizen of said State of Missouri, and Henry Chess, Walter Chess and Harvey B. Chess, residing at Pittsburg in the State of Pennsylvania and citizens of said State, co-partners trading as Chess Brothers, bring this their bill of complaint against
2 Eugene S. Bradford, Joseph C. Millichamp, N. J. Schmucker,
Junior, and N. J. Schmucker, all residing at Philadelphia in the State of Pennsylvania and citizens of said State.

And thereupon your orators complain and say that heretofore and before the seventh day of May 1894, one John F. Golding of Chicago, Illinois, was the original and first inventor of a new and useful Method of Making Expanded Sheet Metal, not known or used by others in this country, or patented or described in any patent or printed publication in this or any other country before his invention or discovery thereof, and not, at the time of his application for letters patent therefor, on sale or in public use for two years, or abandoned.

Your orator further shows unto your Honors that the said John F. Golding, so being the inventor of the said improvement in Methods of Making Expanded Sheet Metal, made application for letters patent therefor to the proper department of the Government of the United States in accordance with the then existing Acts of Congress, and duly complied in all respects with the conditions and requirements of said Acts of Congress and that by an instrument in writing duly executed and delivered by the said John F. Golding, and recorded in the Patent Office of the United States at Washington before the delivery of letters patent on the said application, the said John F. Golding did assign unto your orator The Expanded Metal Company, its successors and assigns all his right, title and interest in and to the said Invention or improvement in methods of making expanded sheet metal and in and to the application for letters patent therefor and the letters patent that might be granted thereon, and that on the Ninth Day of October 1894, Letters Patent No. 527242, were, in due form of law, issued and delivered to your orator The

Expanded Metal Company, in the name of the United States of America, and were signed by the Assistant Secretary of the
3 Interior Department of the United States, and countersigned
by the Commissioner of Patents, whereby there was granted to your orator, The Expanded Metal Company, its successors and assigns for the term of seventeen years from the said ninth day of October 1894, the full and exclusive right to make, use and vend the said patented improvements in Method of Making Expanded Sheet Metal throughout the United States of America, and the Territories thereof, as by the said letters patent, or a duly authenticated copy thereof, ready in Court to be produced will more fully and at length appear.

And your orator further shows unto your Honors that by virtue of a certain agreement in writing between your orator, The Expanded Metal Company and the firm of Chess, Cook and Company, of Pittsburg, in the State of Pennsylvania, of which said firm of Chess, Cook and Company your orators, Henry Chess, Walter Chess and Harvey B. Chess, trading as Chess Brothers, became prior to the acts herein complained of the successors, your orators, the said Henry Chess, Walter Chess and Harvey B. Chess, trading as aforesaid, became and are now the sole and exclusive licensees to make, use and sell to others within the States of New York, Pennsylvania, New Jersey, Delaware, West Virginia and Ohio, Expanded Metal made in accordance with the invention or improvement in Methods of Making Expanded Sheet Metal described and claimed in the said letters patent 527242.

Your orators show that by virtue of the premises your orator The Expanded Metal Company became and is now possessed of the entire right, title and interest in and to the said letters patent 527242, and that your orators Henry Chess, Walter Chess and Harvey B. Chess were at the time of the acts herein complained of and are now possessed of the exclusive right within the territory comprising the said States of New York, Pennsylvania, New Jersey, Delaware,
4 West Virginia and Ohio, to practice the method described in
the said letters patent 527242, and to sell to others within said territory the product thereof.

Your orators further show unto your Honors that the said patented improvements in Methods of Making Expanded Sheet Metal and in Machines for making Expanded Metal are of great benefit and utility and have been and are extensively used by your orators in the manufacture of Expanded Metal and through the efforts of your orators their agents and licensees the said expanded metal has become widely and extensively introduced and used throughout the United States and foreign countries and is very widely and favorably known, and that your orators have been at great labor and expense to thus successfully and extensively introduce the said expanded metal into use and that the public have generally recognized and acquiesced in the rights of your orator under the said letters patent 527242, and that your orators have been in the receipt and enjoyment of large profits from the use of the said inventions.

Your orators further show unto your Honors that the defendants

herein named, well knowing all the facts hereinbefore set forth, and against the will of your orators and in violation of their rights and conspiring and confederating together to injure your orators have joined together under the name of "Diamond Metal Lath Company" for the purpose of infringing upon your orators' rights in the said letters patent, and have jointly infringed upon each of the said letters patent and the exclusive rights of your orators, thereunder, since the dates thereof, and since your orators, the said Henry Chess, Walter Chess and Harvey B. Chess became the exclusive territorial licensees thereunder, as aforesaid by practicing the method of making expanded sheet metal, in the manufacture of expanded metal, substantially as is described in the said letters patent 527242; all of
which acts and doings are contrary to equity and good con-
5 science and to the great gain and profit of the defendants and
and to the great loss and injury of your orators.

For as much as your orators can have no adequate relief except in this Court, and to the end therefore, that the defendants may, if they can, show why your orator should not have the relief prayed for, and may make a full disclosure and discovery of all the matters aforesaid, and according to the best and utmost of their knowledge, remembrance, information and belief, full, true, direct and perfect answer make to the several matters hereinbefore stated and charged, but not under oath, an answer under oath being expressly waived:

And that the defendants may be decreed to account for any pay over the income of profits thus unlawfully derived from the violation of your orators' rights and may be restrained from any further violation of the said rights, your orators pray that your Honors may grant a writ of injunction issuing out of and under the seal of this Honorable Court, perpetually enjoining and restraining the said defendants, their agents, clerks, attorneys, servants and workmen, from any further construction, sale or use in any manner of the said patented improvements, or either of them, in violation of your orators' rights as aforesaid, and that infringing machines for making expanded metal now in possession of the defendants may be destroyed or delivered up to your orator for that purpose.

And that your Honors, upon rendering the decree above prayed for, may assess, or cause to be assessed in addition to the profits unlawfully obtained and to be accounted for by the defendants as aforesaid, the damages your orators have sustained, by reason of such infringement, and may increase the actual damages so assessed to a sum equal to three times the amount of such assessment, under the circumstances of the willful and unjust infringement by the defendants as herein set forth.

6 And your orator prays that a provisional or preliminary
injunction be issued restraining the defendants from any further infringement of the said letters patent pending this cause, and for such other and further relief as the equity of the case may require and to your Honors may seem meet.

May it please your Honors to grant unto your orators, not only the writs of injunction conformable to the prayers of this bill, but also a writ of subpœna of the United States of America, issuing out of this Honorable Court, and directed to the defendants herein, the said Eugene S. Bradford, Joseph C. Millichamp, N. J. Schmucker, Junior, and N. J. Schmucker, commanding them to appear and answer unto this bill of complaint and to abide and perform such order and decree in the premises, as to the Court may seem proper and be required by the principles of equity and good conscience.

THE EXPANDED METAL COMPANY,
Per JOHN F. GOLDING.
CHESS BROTHERS,
Per WALTER CHESS.

ERNEST HOWARD HUNTER,
Solicitor and Counsel for Complainants.

7 UNITED STATES OF AMERICA,
District of ——, —— County, ss:

John F. Golding being duly sworn deposes and says:

I am a Director of The Expanded Metal Company, one of the complainants named in the foregoing bill of complaint.

I have read the same and know the contents thereof, and the same is true of my own knowledge and belief except as to the statements contained therein which are made upon information and belief, and as to those I verily believe them to be true.

JOHN F. GOLDING.

Sworn to and subscribed before me this twenty-eighth day of April, 1903.

R. M. KELLY,
[SEAL.] *Notary Public.*

Commission expires 19th Jan., 1907.

8 In the Circuit Court of the United States. In Equity.

April Session, 1903. No. 14.

THE EXPANDED METAL COMPANY and HENRY CHESS, WALTER CHESS, and HARVEY B. CHESS, Copartners, Trading as Chess Brothers,

vs.

EUGENE S. BRADFORD, JOSEPH C. MILLICHAMP, N. J. SCHMUCKER, JR., and N. J. SCHMUCKER.

Proofs for final hearing, taken on behalf of complainants pursuant to the 67th rule in equity and its amendments, at 926 Walnut street, Philadelphia, before R. M. Kelly, notary public, as special examiner by agreement of counsel, commencing on Friday, March 25th, 1904, at 11.30 a. m.

Present: Mr. Ernest Howard Hunter, for complainants; Mr. George Lewes Cooper, for defendants.

It is stipulated and agred that printed Patent Office copies of United States and foreign patents may be used in this case by either of the parties, in lieu of the originals or certified copies with the same force and effect as the said originals or certified copies, subject, however, to correction thereby, if necessary.

JOHN F. GOLDING called as a witness on behalf of complainants, and having been duly sworn by the Examiner, testifies as follows:

9 Direct examination.

By Mr. HUNTER:

Q. 1. Where do you reside?
A. I reside at 315 West 97th Street, New York City, New York.
Q. 2. What is your occupation?
A. I am a Director in the Expanded Metal Company, one of the complainants.
Q. 3. Are you the patentee, or inventor, named in the Letters Patent of the United States No. 527242, dated October 9, 1894, for Method of Making Expanded Sheet Metal, the same being the patent in suit?
A. I am; at that time I resided in Chicago.
Q. 4. For how long have you been familiar with expanded metal and the art of making the same?
A. Since I made the first piece of expanded metal, and prior to my patents for expanded metal, which were patented in 1884.
Q. 5. Do you refer to patent No. 297,382, dated April 22, 1884?
A. I do.
Q. 6. Do I understand that you claim to be the originator of what is known as expanded metal?
A. I do.
Q. 7. Prior to the invention of the patent in suit, what methods or processes were employed in practice for making expanded metal?
A. A number of steel discs were mounted upon the center shaft, the width of the discs determined the width of the strands to be cut, and there were washers between the discs of the same width as the face or width of the discs. There were two sets of these discs on two separate shafts, one set above the other and matching into the spaces between the discs, each disc having cut-away portions breaking joint with each other, same cut-away portion being for the purpose
10 of leaving an uncut portion of the metal in the sheet.
By this means, that is rotating the cutters together, the sheet had alternating slits and uncut portions. The next operation was to open or stretch the sheet apart at the cuts, causing the sheets to expand in one direction but shorten longitudinally. I made no practical machine, whereby I could successfully stretch the sheet, or rather pull the sheet open, and only made a limited quantity of the metal, following the process of shearing, by drawing it open by hand, this being impracticable commercially. The foregoing acts being particularly with reference to patent 320,240, dated June 16, 1885, and followed my article patent No. 297,382 of April 22, 1884.

I had determined in my own mind that expanded metal could not be a commercial article until I could devise a machine which would

both cut and open the metal in a single operation; and this I discovered could be done by the methods which I described in my patent No. 320,242, patented June 16, 1885, and I devised the cutting mechanism in a machine as described in patent 320,241, patented June 16, 1885, and in which patent I was joined by George B. Durkee. This process is a shearing and opening of the metal, the upper cutters in the machine following the under cutters of the machine in their receding or horizontal movement. The metal might better be described as "deployed"; the word "stretching" in these patents refers to the act of opening the sheet and not to the stretching of the strands forming the meshes or the changing of the molecular construction of the metal. The expansion of the sheet shortens the finished product to the extent of the difference in the measurements around the meshes to the length of the mesh longitudinally from the finished point of the cutting at either end of the mesh. This process and machine I found had serious limitations, as the form of the cutters was necessarily such as to have fragile points both top and bottom, and were therefore liable to
11 break off when used upon sheet steel of a greater thickness
than a sixteenth of an inch, except the cutters were made as described in patent 320,241, patented June 16, 1885, in which case the cutters overlapped each other, but by so doing their thickness determined the width of the strand to be cut, and a new set of cutters and readjustment of parts of the machine would be necessary to cut various widths of strands. The cutters in patent 381,231, patented April 17, 1885 were also limited to the cutting of one width of strand, except the angle of the cutters were changed. If their faces were turned so as to nearly represent one straight line the strands to be cut would be very narrow, whereas if they were set so as to represent a number of parallel lines these strands could be made of greater or less width, but this would require changing the holders of the cutters and also the guiding device, which had always to direct the metal on the angle at which the faces of the cutters were set in the machine. The limitations referred to in this machine caused me to seek for some other process for the manufacture of expanded metal.

Q. 8. Besides the other limitations and difficulties met with in the two prior processes which you have described, I understand that in each of them the opening up of the metal, after it was cut, resulted in a shortening of the sheet as compared with the original length of the sheet; is this correct?

A. Yes; after it was cut, as described in the first patents, and as it was cut in the second series of patents referred to.

Q. 9. Can you produce a sample of expanded metal made in accordance with either of these prior processes which you have described?

A. I have none of that described in the first series of
12 patents, as I never made it commercially. I produce a sample
made under the second series of patents. I would say that it had a further limitation of value as a commercial article, because of the irregularity in the position of the strands one to the other, and it was most difficult to operate the machine so as to have the

intersections in one direction always at right angles with the intersections of the opposite directions in the sheet after it was cut and expanded.

The sample produced by the witness is marked for identification; "Sample A: Old Process."

Q. 10. Will you now please describe the improvement in the process of making expanded sheet metal which is described in your patent 527,242, dated October 9, 1894.

A. I found by experimenting with a cold chisel, having its cutting end shaped similar to half of a diamond mesh, as shown on the last series of cuts in A Fig. 1 of patent 527,242, patented October 9, 1894, that I could work thicker metal than by the process of the other patents described, and that the results produced a finished article of the same length as the original sheet due to the fact that the strands forming the meshes were elongated, and that the pressure imposed by cutters so formed had the effect of giving perfect alignment to the strands and produced altogether a more acceptable article. My first experiment with a cutter put into a power machine showed that the cutting of the second series of cuts somewhat distorted the lines of the metal which had already been cut, but it was evident that if all the cuts necessarily in the length of the sheet were made at a single stroke of the machine there would be no distortion of the metal already cut. This art is now being practiced with sheet steel and other soft homogeneous metals including thickness from No. 27 wire gauge to and inclusive of three-eighths of an inch in thickness.

Q. 11. Will you enumerate the advantages possessed by expanded metal made under this 1894 patent in suit as compared with the expanded metal made by your previous processes?

13 A. The advantages are the perfect regularity in the form of the meshes, and the fact that the intersections in one direction of the sheet are at right angle with the intersections in the opposite direction of the sheet, and the great advantage of being able to cut any thickness of metal which will yield to the power of the cutters. The fact that the strands forming the meshes in this patent of October 9, 1894, are stretched in the act of cutting gives a greater width to the sheet and yet does not shorten the sheet. It has also been found by actual test that the stretching or drawing of the metal in the strand adds very considerably to its ultimate tensile strength somewhat like wire drawing.

Q. 12. Can you produce a sample of the expanded metal made under patent of 1894 in suit?

A. I produce a sample of what we call our ¾ inch mesh made under that patent.

The sample produced is marked for identification Sample B: Process of Patent in Suit.

Q. 13. Are you familiar with the extent of the business done by the Expanded Metal Co. and its licensees?

A. Yes, but I could not give you the exact number of tons cut annually.

Q. 14. Will you state, as nearly as you can, the amount of expanded metal made in accordance with the 1894 patent in suit, which has been sold by the Expanded Metal Co. and its licensees?

A. In the neighborhood of ten thousand tons annually.

Q. 15. Are you acquainted with the defendant, Eugene S. Bradford, and if so, how long you have known him?

A. I have known Mr. Eugene S. Bradford since 1885, or possibly earlier than that.

Q. 16. Have you, within the past year, seen in operation a machine for making expanded metal in this city?

14 A. I have.

Q. 17. Where and when did you see that machine?

A. At the factory of the Diamond Metal Lath Co., in this city, on the 14th of April, 1903.

Q. 18. How did you know it was the factory of the Diamond Metal Lath Co.?

A. By the sign outside.

Q. 19. Did you see any person there while you were examining the machine?

A. I called there in Company with a Mr. Kearns of Boston, and after some difficulty I brought a workman to the door and inquired of him if Mr. Bradford was there. He told me that Mr. Bradford was not there. I told him I knew Mr. Bradford personally and had come to see his machine for making expanded metal. He asked me in to the works along with Mr. Kearns, and showed me the machine and some of the lathing made upon it, as well as a stock of uncut steel. The machine was not running when I went into the works, but on my suggestion that I would like to see it run, he put it in operation, and made several pieces of expanded metal of lengths of about three feet long lengthwise of the mesh and of about fourteen inches wide measuring crosswise of the mesh. I did not take exact measurements and can only give these lengths and widths from my impression.

Q. 20. Did you subsequently have any conversation with the defendant, Mr. Bradford about this machine?

A. On the same day that I viewed the machine I telegraphed to Mr. E. S. Bradford at his home address saying that I had seen his machine and would like to have him come to the Walton Hotel. In the course of an hour or two Mr. Bradford met me at the Walton Hotel.

Q. 21. Did he then make any statement to you as to whether or not the machine in question was his machine or the machine invented by him?

15 A. In the discussion which followed, the machine which I saw was always referred to as his patent, and he told me of his having taken out the patent, and considerably as to how he held the patents in company with others who had furnished capital for the building of the machine.

Recess.

It is stipulated and agreed by counsel and admitted for the purposes of evidence in this case, that on the 14th day of April, 1903, the defendants, Eugene S. Bradford, Joseph C. Millichamp, Nicholas

J. Schmucker and Nicholas J. Schmucker, Jr., were operating a machine for making expanded sheet metal under the name of Diamond Metal Lath Company in the City of Philadelphia, the said machine being the invention of Eugene S. Bradford, and the place where the same was in operation at that time being located at Water and Mifflin Streets, in the City of Philadelphia.

Q. 22. Will you describe the construction and mode of operation of the machine which you saw in operation at the establishment of the Diamond Metal Lath Co., on April 14, 1903?

A. It was a machine measuring over all about thirty feet in length, raised some three feet from the floor of the building, and consisted of an iron bed plate, on which were mounted, at that time, I think, twenty-three sets of rolls, two rolls on each set, one above the other. The under set of rolls, on their one end, carried disc cutters, and the upper roll cutting discs which were separated from the outer periphery inward toward the center to a depth of possibly a half an inch, the serrations forming a flat V-shape recess between the cutters which likewise formed an inverted V-shape. The inner or flat side of these V-shaped cutters revolved in the plane of the outer face of the disc on the lower cutter. The metal was fed to the machine in strips of about seven inches in width by three or four feet
16 in length, as desired, and one edge of the sheet first encountered the V-shaped cutter with the corresponding lower disc, making an incision in the metal and at the same time stretching the metal strand thus cut downward to a position representing a flat letter V, as shown in the drawing. The revolution of these two first rollers would reproduce similar effects along one edge of the sheet until the sheet was sufficiently far advanced to encounter the next series of discs. The points in this second series of discs encountered the sheet metal opposite to and back of the intersections left in the sheet metal by the action of the first series of cutters, and so on until the metal had passed entirely out of the machine. The workman in charge of the machine explained that the collars which were outside of the cutting discs, and which also had formers to correspond with the cut metal, were for the purpose of preventing the distortion or buckling the metal which had already been cut. These collars encountered the cut metal some distance below the cutting discs and were designed, as he said, to prevent the metal from buckling up. This buckling is very similar to what I have already described would be the case were I operating under the last patent by making all of the meshes in a sheet by one cutter. I should have said that the cutters in the machine do not represent the direct angle of a V. as shown in the drawing of the Bradford patent No. 664,379, patented December 25, 1900, but rather represented a flat U shaped letter. This form of cutter would operate to give more uniform stretch to the full length of these strands forming one side of the mesh, and the same would be true when the next series of cutters encounters the metal and forms the other side of the mesh. As previously stated the finished sheet was practically the same length as the blank sheet from which it was cut. This is an inherent necessity for the reason that the machine makes one-half of a mesh at each cut, and the strands

forming such half-mesh are rigidly fixed to the metal which
17 forms the intersections of the strands and which remain a part
of the whole uncut sheet until the next half diamond, behind
it, and breaking joint with it, is produced.

Q. 23. Will you compare the Bradford patent, No. 664,379, dated December 25, 1900, which you have mentioned, with the machine you saw operated at the establishment of the Diamond Metal Lath Co., on April 14, 1903, and point out any differences which you note betwe-n the two?

A. I did not undertake to retain in my mind the actuating parts of the machine, but took careful note of the relative position of the cutters and of their effects upon the metal, and with the exception of the cutters being much more rounded than are shown in the view of the cutting discs described in the patent, their operation was to cut and simultaneously stretch the strands forming the meshes.

Q. 24. I understand that in the operation of this machine, as you saw it, after one row of slits was formed and the strands thereof were stretched by the elongation of the metal composing them, the next row of slits was formed alternate to the first, and the strands thereof were similarly stretched by the elongation of the metal; is this correct?

A. That is correct.

Q. 25. Will you explain a little more fully the location of these collars that you say were arranged outside of the serrated cutters?

A. So far as I can see, they were affixed to the same pinion or shaft which rotated the upper cutting discs and rotated with it.

Q. 26. What was the peripheral shape or form of these outer discs or collars?

A. Very much like the cutting discs.

Q. 27. Will you describe more at length the size of the finished piece or expanded metal produced by this Bradford machine as you
saw it in operation, as compared with the original sheet or
18 blank from which it was produced?

A. I did not measure the finished sheet, but it was about three times the width of the original sheet, and I should have said more particularly that this increase in width of the finished sheet, in comparison with the width of the blank from which it was made, was wholly due to the fact that the strands forming the meshes have, by the process of cutting and stretching them, elongated in exactly the same manner as is the case in my process patent of '94, but with the difference that the U-shaped cutter did not leave the strands in straight line, and it further means that in the Bradford machine the strands have to be stretched more than they would have been had they been left in straight lines.

Q. 28. Can you identify a piece of expanded metal made on the Bradford machine to which you have referred?

A. I can identify the piece exhibited as exactly similar to the metal I saw produced at the Diamond Metal Lath Company's Works.

The sample identified by the witness is marked for identification Sample C, Defendants' Expanded Metal.

Complainants' Counsel offers in evidence printed Patent Office copy Letters Patent of the United States 527,242, dated October 9, 1894, to Expanded Metal Co., assignee of J. F. Golding, for Method of Making Expanded Metal, and the same is marked Complainants' Exhibit No. 1, Complainants' Patent in suit;

Also printed Patent Office copy of Letters Patent No. 297,382, dated April 22, 1884, and the same is marked Complainants' Exhibit No. 2, Golding's 1884 Expanded Metal Patent;

Also printed Patent Office copy of Letters Patent No. 320,240, dated June 16, 1885, and the same is marked Complainants' Exhibit No. 3, Golding's 1885 First Process Patent;

19 Also printed Patent Office copy of Letters Patent No. 320,241, dated June 16, 1885, and the same is marked Complainants' Exhibit No. 4, Golding & Durkee 1885 Machine Patent;

Also printed Patent Office copy of Letters Patent No. 320,242, dated June 16, 1885, and the same is marked Complainants' Exhibit No. 5, Golding & Durkee Second Process Patent;

Also printed Patent Office copy of Letters Patent No. 381,231, dated April 17, 1888, and the same is marked Complainants' Exhibit No. 6, Golding's 1888 Machine Patent;

Also printed Patent Office copy of Letters Patent No. 664,379, dated December 25, 1900, to E. S. Bradford, and the same is marked Complainants' Exhibit No. 7, Defendants' Patent;

Also the exhibits heretofore marked for identification as samples A, B, and C, and the same are marked respectively Complainants' Exhibit No. 8, Sample A, Old Process; Complainants' Exhibit No. 9 Sample B, Process of Patent in Suit, and Complainants' Exhibit No. 10, Sample C, Defendants' Expanded Metal.

End of direct examination.

Cross-Examination.

By Mr. Cooper:

X Q. 29. Mr. Golding, was the process shown and described in your patent No. 320,240, carried out by the machine shown in the Golding & Durkee patent No. 320,241?

Objected to as immaterial.

X Q. 30. Was a machine similar to that shown and described in patent 320,241 put into practical operation?

A. It made a small amount of metal, but I don't think any of it was ever marketed, for the reason that the machine was built too light for practice.

X Q. 31. Describe the action of the cutters shown in that machine in slitting the metal?

20 A. Fig. 6 in patent of June 16, 1885, shows the metal bent over the lower cutter. In getting to this condition the metal was sheared both along the vertical incline of the cutter and in the horizontal line shown by the dotted lines. The position of the cutters before the act of cutting is shown in Fig 5, but the strip of metal shown to be cut in Fig. 5, projects too far to the right to correspond with the metal in Fig. 6 and hence is incorrectly drawn. These cut-

ters described in Fig. 5 act thus: The upper cutters in their downward movement first shear along their under edges, and as soon as they come in contact with the bevelled edge of the lower cutter, which corresponds with the bevel edge of the upper cutter, these upper cutters act to press the lower cutters to the left and continue to shear the metal along their bevelled edge until the machine has reached its most downward throw, thus *f* works over the face *a* and each cutter likewise overlaps the other, and causes the metal to be sheared, and as the under cutters recede to the left they allow the metal to be opened without stretching the strand. In Fig. 1 of this patent the metal is shown to be deployed downward and to the left and shortened by the difference between a vertical line drawn from the extreme end of the lower mesh and a vertical line drawn in the machine as shown by dark horizontal lines between cutters.

X Q. 32. How many cutters similar to those marked *f* or *g* in Figs. 5 and 6 in the drawings acted simultaneously on a sheet of the metal.

A. This is a guil-otine machine and the metal is fed between the housings, and therefore the length of the sheet to be cut is limited to the distance between the housings; the number of cutters employed depends upon the size of the meshes to be made. If the meshes are larger less knives, if smaller, more knives; but all of the knives act simultaneously.

21 X Q. 33. There may have been approximately forty cutters, were there not?

A. In this machine there might have been thirty in the upper and thirty in the lower.

X Q. 34. You have said in this machine there was no stretching of the strands; how do you know this?

A. I could say that I know it the same as we know that the shearing of one piece of metal from another does not materially lengthen the piece that is sheared away, and for the further reason that the product of the machine is very much shorter than the sheet from which it is made.

X Q. 35. Are machines which make expanded metal similar to Sample A now in use?

A. Machines operated on the principle of the machine which made Sample A are in use, but not making this particular mesh.

X Q. 36. For what purpose is expanded metal chiefly used?

A. Its chief purposes are lathing for plaster work, larger meshes and heavier strands of metal for concrete work, and meshes such as exhibit No. 9, Sample B, and meshes double and quadruple these sizes are used for fencing, window and skylight guards; open work partitions and clothes lockers.

X Q. 37. In metal intended for use as lathing or for concrete work, would the regularity of the form of the mesh or the fact that the intersecting lines were at right angles to each other, be of importance?

A. It would not be so material for lathing, but for concrete work, where it is used as a tension member, the lines are required to be straight in all directions.

X Q. 38. Is the metal made to-day, similar to Sample A, that is by the old process, sold at the same price as similar metal for the same purpose made by the newer process?

22 A. No; we get an advanced price for our Diamond form of lathing over the old form of lathing; or where we do not get an advanced price, it is preferred by the contractors to whom we sell.

X Q. 39. What was your purpose of visiting the factory of the Diamond Metal Lath Co., in April, 1903?

A. Samples of the metal, as made by the Diamond Metal Lath Co., has been sent to me by our various agents, and the appearance of the metal led me to believe that it had been made by a machine which infringed my process patents, and I went there on the chance of the inventor letting me see the machine, that I might determine for myself whether it was or was not an infringement.

X Q. 40. When you found out that Mr. Bradford was not at the factory, what did you say to the man at the door?

A. I said to him that I knew Mr. Bradford, and that I came there to see his machine, and the gentleman asked us in.

X Q. 41. Is that all that was said?

A. I told him that I was a friend of Mr. Bradford's.

X Q. 42. Was the piece or were the pieces of metal, which you saw cut, of commercial or standard size?

A. No; we could not sell any great quantity of the sizes that he cut that day, but he did not have all the cutters in, or, he said, he could produce a larger piece. The blank sheets they had on the floor were the proper length.

X Q. 43. As I understand, you have no personal knowledge that this machine was ever used except to make these pieces of expanded metal to which you have testified. Is that a fact?

A. I only know of the metal being offered for sale to other parties. I do not know that Mr. Bradford told me that they had a large consignment of steel on the way to the factory for the purpose of making these lathings.

X Q. 44. As I understand, you made no measurements of the length of the sheets worked upon either before or after the operation.

23 A. I had no rule with me to measure it, but it was the first thing I asked Mr. Bradford when I met him whether the product was the same length as the sheet, and he replied in the affirmative. I did this with a view of having him commit himself upon that point.

X Q. 45. Are you familiar with the art of making lathing in general?

A. Fairly well.

X Q. 46. Have you seen various machines and various patents for machines for doing this work?

A. I have seen probably six or eight specimens of various kinds of metal lathing, but I have not seen any other machine making lathing excepting Mr. E. S. Bradford's machine and, of course, of the machines used by The Expanded Metal Co.

X Q. 47. Have you seen many patents for machines for making metal lathing?

A. Yes; I have read over quite a number of patents.

X Q. 48. Was the patent in suit, inso far as your knowledge goes, the first disclosure of a method of or machine for simultaneously slitting and bending portions of a sheet of metal in alternate places to produce an expanded sheet of metal?

A. Yes; in the sense of expanding it away from the plane of the sheet of metal to produce a finished sheet of metal wider than the blank metal from which it was made, while preserving the length.

X Q. 49. Was the patent in suit the first disclosure of a method of or machine for making open or reticulate metal sheets and stretching or elongating the bars between these slits?

A. No.

X Q. 50. Was the patent in suit the first disclosure of a method of or machine making open or reticulate metal sheets of greater width than the original sheet and of the same length.

24 A. No; it is not. The machine invented by Mr. Fordyce, of Newark, New Jersey, cut the metal zig-zag form and allowed it to be opened out, so that the finished sheet would be considerably larger than the blank, and this without stretching the metal. In fact I made metal on exactly the same principle as Mr. Fordyce did and the same year that I invented expanded metal, but I did not consider it worth patenting, as the product was unsightly.

X Q. 51. Was the patent in suit the first disclosure of a method of or machine for slitting or bending portions of a plate or sheet of metal thereby producing an expanded sheet, the length of either longitudinal edge of which was the same as that of the original sheet?

A. Yes.

X Q. 52. Was the patent in suit the first disclosure of a method of or machine for making open or reticulate metal work by slitting and bending portions of a plate or sheet of metal, and then similarly slitting and bending in places alternate to the first mentioned portions, thus producing a finished expanded sheet of metal the length of the longitudinal edge of which was the same as that of the original sheet?

A. I would say yes, with the exception of the qualifications which I made to the Fordyce patent.

X Q. 53. Was the patent in suit the first disclosure of a method or machine for making open or reticulate metal work by cutting parallel, alternately disposed slits in a sheet and bending the slitted metal to open it and produce an expanded sheet of the same length as that of the sheet before this final bending or expanding operation?

A. I am afraid I can't distinguish between that and your last question. There was a machine made which corrugated the sheet of metal and then cut and opened out and spread it on the plane of the corrugated sheet, leaving parts of the original flat sheet on either side. In other words it produced a sheet of metal, the thick-
25 ness of the corrugated sheets, with openings in it, but that
machine shortened the metal in one direction. I should therefore have answered the question in the negative.

Cross-examination closed.

In Equity.

April Session, 1903. No. 14.

THE EXPANDED METAL COMPANY and HENRY CHESS, WALTER CHESS, and HARVEY B. CHESS, Co-partners, Trading as Chess Brothers,

vs.

EUGENE S. BRADFORD, JOSEPH C. MILLICHAMP, N. J. SCHMUCKER, JR., and N. J. SCHMUCKER.

Depositions in rebuttal on behalf of the complainant, taken before R. M. Kelly, notary public and special examiner, at 926 Walnut street, Philadelphia, commencing on Wednesday, September 7, 1904, at 3.30 p. m.

Present: Mr. E. H. Hunter, for complainant; Mr. E. H. Fairbanks, for defendant.

JOHN F. GOLDING recalled in rebuttal, testifies as follows in answer to questions:

Direct examination.

By Mr. HUNTER:

Q. 1. Please state whether or not, expanded metal was commercially manufactured under the process described in complainants' exhibit No. 3 Golding's 1885 First Process Patent and if so, to what extent?

26 A. There was not to exceed five square yards of such metal and none was ever sold.

Q. 2. Was any expanded metal made commercially by you, or any of the Companies with which you have been associated, by a process in which the sheet was first formed with rows of alternate slits or slots and then pulled out or stretched in the plane of the sheet to open out the meshes; and if so, to what extent?

Objected to as leading.

A. The only party who ever made any metal of the kind referred to were Schutmer & Kreamer, or Gartman & Gartman, Germany, who under a patent subsequent to my first patent slotted sheets of metal and opened it out by clamping the edges of the sheets of metal at intervals and exerting force to pull it out on the plane of the sheet, but they discontinued this and engaged in the manufacture of expanded metal under my more recent patents, so that there is not now to my knowledge any such metal being made by Companies that I have been associated with.

Q. 3. Why did you not make expanded metal in this manner?

A. Because the product is very irregular and necessarily limited to very light work, and almost if not quite impracticable.

Q. 4. You have, I believe, in your former deposition in this case stated that after satisfying yourself that this method of first slitting a sheet and then pulling it out in the plane of the sheet was commercially impractical, you devised the method described in Patent 320,242, dated June 16, 1885, will you please explain wherein the method described in this patent differs from the method of first slitting and then pulling out the sheet transversely to its plane.

A. As I have stated, I regarded the attempt to first slit and then
to open the slit sheet as being impractical commercially, be-
27 cause of the difficulty of giving regularity to the form of each
mesh. The act of pulling the sheet apart after it was slit distorts the form of the meshes due to the irregular temper of the steel or metal worked upon or varying thicknesses thereof in the same sheet. Further it was very difficult to use a uniform stretch through the whole length of the sheet. I therefore, determined in my own mind that expanded metal, originally called slashed metallic screening, could not be commercially made except if it could be cut and opened in a single operation. As in my past experiment in cutting and opening a sheet I had found that it materially shortened, my thoughts were directed to a means of making the metal which would provide for this shortening, and I conceived the idea that by beginning at one corner of the sheet with the first cut and by making the subsequent cuts in step form within the sheet and back of the first cut that the metal would open out as it was cut, and I dwelt upon this mode of work until I discovered that — was possible to set lower and upper cutters in a position that would perform the process.

Q. 5. Why was it necessary to begin at the corner with the first cut and to make the subsequent cuts in step form within the sheet and back of the first cut?

A. That is so the metal would be free at one end to swing backward, that is to deploy away from the plane of the sheet and allow it to shorten sufficient to provide for the opening of the mesh, that is the connecting intersections of the meshes required to come together to allow the strands of the metal to be separated sufficiently to provide the required size. In what is known as our two and a half inch mesh this coming together of the intersections of the meshes represents nearly an inch.

Q. 6. I direct your attention to the Golding & Durkee patent 381,230, dated April 17, 1888, state whether or not the machine de-
scribed in that patent is intended and designed for carrying
28 out the method or process described in the patent 320,242 of
June 16, 1885 to which you have just referred?

A. It was so intended and did carry out the process, and a very considerable quantity of metal was sold as the result.

Q. 7. Will you illustrate by a model the operation of the cutters in carrying out the process described in your patent 320,242 of June 16, 1885, and in this patent 381,230 of April 17, 1888?

A. The model which I show has two lower and two upper cutters. The lower cutters are fixed to a sliding bar which is movable to the right and left on the plane of the faces of the cutters. The upper cutters are set on the same plane with the faces of the lower cutters. When the upper cutters are in their raised position, the lower cutters take a forward position, that is to the right hand, until the lowest point of the upper cutters is nearly over the line of meeting of the two under cutters. The metal to be cut and opened is placed between these cutters, the upper cutters descend and the lower cutters recede to the left hand, and as soon as the opper cutters have pierced the metal the receding of the lower cutters allows the upper cutters to pass downward and to shear and bend the metal into the form of the mesh. The shearing is continuous with the action of the cutters from the start to the finish of the whole mesh, that is, each fall of the upper cutters completes as many meshes as there are upper cutters in the machine. The receding action of the lower knife and the following of the upper knife permits the metal to contract in the direction of the receding lower knife, that is, to the left, as shown in the model, and this receding or shortening, as explained, in our 2½ inch mesh is about one inch, as the measure around the mesh and directly across the diamond longitudinally will show.

Q. 8. I note that the form of the cutters in the model you
29 have produced differs somewhat from the form of the cutters
shown in the Golding & Durkee 1888 patent No. 381,230;
does this difference in form make any difference in the operation of the machine in carrying out the process of patent 320,242?

A. The effects are precisely the same. The style of cutter shown in the model is the one that has proved to be the most practical. In fact the cutter as shown in the patent 381,230 were only applied to two small machines which were not used commercially, as they were built too light for use.

Q. 9. Are the cutters which are in the model you have produced, cutters of the size and form actually used in the commercial production of expanded metal?

Objection as leading.

A. The cutters as shown in the model are what we term worn-out cutters, that is, they have become too thin by frequent grinding for further use, and they are from one of our machines which has been in use for a number of years.

The model produced by the witness is offered in evidence and the same is marked "Complainants' Exhibit, No. 11, Model Golding Second Process."

Q. 10. Can you produce a piece of expanded metal made according to your second process, that is under patent 320,242 by a machine of the character shown in patent 381,230 employing cutters of the character present in the Model Exhibit No. 11?

A. Sample of metal is produced.

Q. 11. Was this metal which you have just produced made on one of your commercial machines in the regular course of business, or is it a piece of metal which has been specially cut for the purpose of this case?

A. It is a piece of metal cut by the same machine to which cutters

in the model exhibited belong. I should say it was cut in
30 the regular course of business. There is nothing peculiar or
in any way or different from our commercial style.

The sample produced is offered in evidence and marked Complainants' Exhibit No. 12, Sample D: Old Process.

Q. 12. How long did you and the companies or persons associated with you continue the manufacture of expanded metal by the process described in patent 320,242, and under a machine of the character of patent 381,230 before taking up the new process of the patent in suit?

A. We began commercially manufacturing the second process shortly after the issue of the patent in 1885, and continued to do so until I invented the new process and had developed machinery for practicing such new process, about 1895, and in fact, some of the machines are still *is* use making metal as shown in Sample D, that is in the United States; none is in use abroad.

Q. 13. Did you and those associated with you find expanded metal of this character, that is, made under the process of patent 320,242 of June 16, 1885, and by the machine of the character shown in 381,230, entirely satisfactory?

A. They were not entirely satisfactory, from the fact that the product had serious limitations, first because it was restricted to cutting metal under 3-32 of an inch thick, and secondly, because of the irregularity of the shape of the strands forming the meshes. It was a decided advance over my first attempt, but I had not in these patents accomplished the perfect result I had anticipated.

Q. 14. Were these limitations and restrictions recognized at that time, prior to 1894?

A. Certainly; yes, they were, and so much so, that a number of our Companies entirely failed to success in the manufacture of this product.

Q. 15. Did you, during this period, give any time or thought
to the subject, to the end of improving the manufacture of
31 expanded metal to overcome the restrictions and limitations
of the method you were practicing?

A. I was constantly and seriously impressed with the restrictions to the sale and use of the metal as then made, that is during the whole time we were confined to the manufacture of the metal as shown in sample D.

Q. 16. You have in your former deposition in this case described the making of the invention described in the patent in suit; was there anything in the process as practiced by you and your associates prior to the making of that invention or in this art generally with which you are familiar, that suggested to you the idea that you might make expanded metal by simultaneously cutting and opening up the meshes and at the same time elongating or stretching the strands?

A. Nothing as practiced in the art.

Q. 17. In the process carried out by machines of the character of the Golding & Durkee patent, 381,230, was there any stretching of the strands while they were being cut and opened out?

A. Only such stretching as was incident to shearing.

Q. 18. Practically how much did that amount to?

A. Well, it is a matter that was never taken note of for the reason that we were in no wise depending upon any stretch of the metal.

Q. 19. In your practical experience in the commercial production of expanded metal by machines of the character described in Patent 381,230, would it in your opinion, be possible to produce a sheet of commercial expanded metal of a length equal to or greater than the length of the original sheet, by using that process with more or less ductile metal?

A. It would not; the action of the machine as exhibited in the model shows that the metal is sheared and deployed away from the plane of the metal to provide for the whole contraction incident
32 to the opening of the mesh, and this same thing would
apply if lead were used in the operation; the contraction would be practically the same as is shown with the operation on steel as it is purely a shearing process.

Adjourned to Thursday, Sept. 8, 1904, at 10:30 A. M.

THURSDAY, *Sept.* 8, 1904.

Met pursuant to adjournment at 10:30 a. m.

Direct examination of JOHN F. GOLDING continued.

By Mr. HUNTER:

Q. 20. Can you produce a partially formed piece of expanded metal made under the second process on a machine of the character of patent 381,230, to illustrate the manner of cutting and forming the strands from the sheet?

A. The piece of metal here presented partially cut and partially uncut in step form, as shown by my second process patent, was made in our Pittsburg factory. The only difference between this piece and the first piece made by my second process and exhibited at this hearing is that one is made by means of a larger set of cutters than the other.

The piece of metal produced is offered in evidence and marked Complainants' Exhibit No. 13 Sam- E: Old Process.

Q. 21. In answer to question 17 you stated that in the process carried out by machines of the character of patent 381,230 there was, during the cutting and opening out of the strands, "only such a stretching as was incident to shearing"; will you please explain more fully what you mean by this stretching which you say is incident to shearing?

A. I mean that the cutters in the machine as operated under my second process patent 320,242 are simply shears, and that they
33 have the same tendency to distort the metal as any ordinary
shears have in the act of separating or cutting a piece of metal asunder, and I further meant that these cutters were not intended to and do not materially elongate any portion of the metal. Their object is to open the metal as it is sheared, and this was why under this process it was necessary to give the under-cutters a horizontal motion.

Q. 22. Will you produce samples of expanded metal made under the process patent in suit showing both a piece of expanded metal and a piece of metal partially cut?

A. The square piece of metal here produced having six whole diamond-shape meshes within it was produced by a machine operating under my third process patent, and the other piece of metal here shown having three finished diamond-shape meshes and three half finished diamond-shape meshes was also produced on a machine operating under my third process patent.

The samples produced by the witness are offered in evidence and are marked respectively, Complainants' Exhibit No. 14, Sample F: Process of Patent in suit, and Complainants' Exhibit No. 15, Sample G: Process of Patent in Suit, Partially Cut.

Q 23. I will now ask you to compare the expanded metal of the character of samples A, D and E, illustrating the old process under your second process patent 320,242, with expanded metal of the character shown in samples B, F and G, made under the process of the patent in suit, stating the advantages, if any, possessed by one form over the other.

A. Samples A, D and E have all been made by my second process, and as it will be observed from viewing the partially made piece that the cuts have been made by shears similar to, but larger than, those shown in the model machine here exhibited, and that provision for the opening of the metal is secured by causing the cut portions
34 to deploy, that is, to swing away from the uncut metal to the extent sufficient to provide the desired opening, and as demonstrable by measuring the metal around the diamond mesh as against the length of the mesh, and further, by holding the unfinished part in a horizontal position as it lay in the machine while being cut and opened, it will be observed that the sheet, that is, the two meshes finished, have contracted the length of the product to considerable less than the length of the original plate from which it has been cut. It will also be observed by viewing either of these three samples that the strands are not straight, nor are they of regular width throughout. It will also be observed that below the uncut strip there is a line of metal almost parallel with it, but that the lines of the strand in the diagonal direction thereto are not nearly in a straight line. This in a finished sheet throws the intersection out of square, that is to say, a line drawn across the intersection longitudinally is not square with a line drawn across the short way of the intersection. The necessity of sliding the under cutters and their necessary shape renders it impractical to cut metal much heavier than the samples shown, in fact, it would be difficult to proceed any length of time in the manufacture of metal more than the thirty-second of an inch heavier than here shown. Besides the shape of the mesh is so much dependent upon the length of the feed given to the sheet metal and the downward extent of the throw of the upper knives, that it is practically impossible to produce expanded metal sheets by this process that is sufficiently square to admit of being neatly or economically affixed in iron framing, and again its appearance is irregular. These latter imperfections have materially restricted its use, and the fact of the

irregular widths of the strands renders it less valuable even for concrete work, where it is hidden from view, for the reason that the strands are only so strong as is represented by their smallest section.

35 Now in the square piece here exhibited, the one having six finished meshes (Sample F), it will be observed that the intersections of the metal in one direction are at exact right angles to the intersection of the metal in the opposite direction, and that the strands of the metal forming the meshes are straight and that they are all of uniform width throughout. The reason of this is, as will be seen be referring to Sample G, that the strands forming the meshes are cut, bent and thereby stretched away from the plane of the uncut sheet between two connecting points, these connecting points become the intersections of the meshes when the next cut back of the intersection is completed. The specimen shows that the cutters of the machine have made a slight incision back of the intersection, and this is the first evidence of cutting, bending and shearing of the strand to be made back of the strand already made, and which form the shape of a half of a diamond mesh. The constant pressure of the cutter which performs these acts insures the metal being uniformly pressed, bent and stretched to its finished position, and in this act the molicules of the metal change form and as has been demonstrated by actual test, strands of metal so formed have an increased breaking stress of from fifteen to eighteen per cent. above that of a piece of metal of the same size otherwise cut from the same plate. The act of the cutter is to shear bend and stretch the metal, thus subjecting it to somewhat the same operation as wire drawing. The uniformity of the metal in every way above referred to has commended it to much more general use than the metal made by my second process patent, and a great variety of thicknesses of metal and widths of strands can be produced upon the machine with the same cutters, that is to say, sheets 7-16 of an inch in thickness are made upon machines operating under this process. I should have called attention to the fact that the operation of the cutters is similar in effect throughout the length of a strand as they are sheared
36 away, bent and stretched downward from the plate, that is to say, each part of the strand is stretched as it is cut and bent. The length of the finished product is perfectly the same as that of the original blank from which it is made.

To briefly contrast No. 2 and No. 3 process I might explain that in No. 2 process it is the provision made for bringing the connecting or intersecting of the strands closer together that provides the necessary metal to form the mesh, whereas in No. 3 process of the patent in suit, the intersections of the metal remain fixed and at the same distance apart and that the metal required to reach around the mesh is provided by giving it the necessary stretch, in other words, it is entirely dependant upon the stretch of the metal.

Q. 24. Will you now state what effect these differences which you have pointed out have had upon the commercial production and use of expanded metal by your licensees?

A. I believe there are only two machines in the United States

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now at all operating under my second process patent; there are no such machines now in use in either of the European countries; there were three such machines in the English Works, but they have either been rebuilt to operate my third process or abandoned, and more than thirty of my new process machines are in operation in the various European countries. Until such new process machines were made, there was practically no success with the business in any part of Europe. The sale of the metal being almost wholly confined to lathing where appearance or uniformity of strength were nonessential. I would like to state too that the metal as made under my second process patent had very limited sale in the United States until I adapted its use as a binder and tension member in fire-proof concrete flooring, and its use there, is of course, limited to short span work, because of our inability to manufacture expanded metal by that process from thick plates, and because of the irregularity
37 of strength in the strands as before explained. The volume of business done under my third patent is vastly greater than that done under my second process, and the metal as produced under my third process patent is employed in many uses where metal made by my second process patent would be rejected.

Q. 25. You have stated that more than thirty machines are operated under the process of the patent in suit in the various European countries. Can you state about how many such machines are operated in this country?

A. I think there are twelve. I would like to explain that the greater number used in all the European countries is due to the fact that under their various patent laws commercial working has to be done within several of the countries, and further that the English Company who operate the greater number of machines practically monopolize the trade of Africa, India, Egypt and South America and Australia, while the other European countries, namely, France, Germany, Belgium, Austria, Spain and Russia are confined to their own countries or their own Colonies.

Q. 26. Did you personally visit England for the purpose of having your inventions for the production of expanded metal adopted there?

Objection is made to this and to all testimony upon the subject of the foreign operations as immaterial and irrelevant.

A. I did.

Q. 27. Did you in connection with such negotiations to bring about the adoption of your inventions in England, or at any other time, ever hear directly or indirectly of the use or production of any metal of the character shown in the British patent of Johnson, or described in the British provisional specification of Long, which have been referred to in this case?

A. I never saw nor heard of any such metal as ever having been produced by anyone; not even a sample, so far as I am
38 aware, is known to exist in any museum or other place, and I never heard anyone say in my whole twenty years exper-

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ience in this business of ever having seen a piece of metal made by either the process mentioned in your interrogatory.

Q. 28. Do you know how the term "expanded metal," as applied to the material here in controversy, originated?

A. It originated in 1884 or 1885 when we had just made a small amount of material under our second process patent. When it happened to become evident that we could make this metal commercially, it became necessary to have some name that would express some recognizable feature of it, and hence we adopted the name "Expanded Metal."

Q. 29. So far as you are aware, has that name been adopted by persons associated with the use of this metal, as applying to it exclusively?

A. I believe that the engineers and architects of this country recognize the product of machines as operating under my patents as the original expanded metal. In one case a firm manufactures what they call herring-bone expanded metal and which came into use about the time of the expiration of my original patent. This, so far as I know, is restricted to use as lathing for plaster work.

Q. 30. In question 23 of the direct examination of Mr. Bradford, defendants' counsel has made the statement that you stated in your testimony that in the course of conversation with Mr. Bradford, he stated to you that the machine of his patents produced expanded metal or *exactly* the same length as the original blank. Have you any statement you desire to make with reference to this?

A. Referring to my cross examination, answer to X Q. 44, it will be observed that I did not say that Mr. Bradford had told me that the finished product of the machine was exactly the same length as the original blank. I quoted him as saying that the finished product was the same length as the blank from which it was made.

39 Q. 31. It appears from Mr. Bradford's testimony that in the expanded metal produced by his machine there is a very slight elongation beyond the length of the original blank amounting to from less than three-tenths of one per cent. to less than seven-tenths of one per cent.; are you able to state to what this slight elongation is due?

A. It is due to the fact that in the first place his machine cuts, bends and stretches the strands which are to form the meshes, and that because of the position the cutters of his machine have, there is a tendency to close the meshes, and as the metal has already been stretched this closure means that the metal would be longer than the sheet; for example, if we were to close the metal made by my last process patent, it would be materially longer than the sheet from which it was made. The closing, however, in the machine as I saw operated, and of which I spoke in my original testimony was not great, and hence had but little effect in lengthening the product.

Q. 32. Is this slight elongation due to this tendency of the meshes to close, an advantage, or does it produce any different result in the character of the metal?

A. No; it is a disadvantage, and Mr. Bradford has tried to over-

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come this by the addition of a disc with a serrated periphery to engage the strands already cut for the purpose of preventing the closing of the meshes.

Q. 33. I now direct you- attention to the patent of Ohl, 475,700; will you please compare the process of producing metallic lathing disclosed in this patent with the process disclosed in your patent in suit, and point out the differences between the two?

A. The expanded metal as produced by the process embodied in the patent in suit, that is my third process patent, is increased in area from two and a half to twelve times that of the original blank sheet or plate from which it is made according to the size of opening.

40 The square specimen Exhibit F, as made under my third process patent shows that a mesh 2½ inches in measurement across its narrow way was made from metal of about 5-16 wide or something over eight times the expansion. It also presents the cut edges of the metal to the surface of the finished sheet. In the case of the Ohl patent No. 475,700 the area of the original blank sheet of metal remains unchanged, that is the superficial area. This does not present an open metal work in the sense of expanded metal, and it is no where so suggested in the patent, and I believe the uses of such metal are restricted to lathing for holding plaster. The loops which appear in the metal are formed by cutters having two cutting edges, and both edges operate wholly within the sheet of metal and not adjacent to either of such other cuts. The difference between metal made by the Ohl patent and that made by the patent in issue, as to make an explanation thereof, seems ridiculous; there is no similarity whatever in the product.

Q. 34. What would be the result in the making of Ohl's lathing if the cutters were placed sufficiently close together to form the successive rows of "strips" or projections immediately adjacent to one another?

A. If the cutters such as described in the Ohl patent were placed immediately adjacent to each other, and their area were sufficiently to cover the surface of a sheet of metal, and these cutters were forced downward upon such sheet of metal, the metal resting on any form which would permit these cutters to pass through it, the result would be that the metal sheet would be entirely cut into strips, that is separate srtips, the width of the faces of the cuts.

End of direct examination.

Recess until two o'clock.

41 Cross-examination of the witness, JOHN F. GOLDING.

By Mr. FAIRBANKS:

De bene esse without waiving the foregoing objections or any of them.

X Q. 35. What is your position, Mr. Golding, with the Expanded Metal Company?

A. I am a Director, but not a paid officer.

X Q. 36. And the Expanded Metal Company comprises a sort of parent Company and a number of branch Companies in different parts of the United States, is that so?

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A. The parent Company is the owner of the patent, but it has no branch companies; it has licensees in various parts of the country. The parent Company holds no shares in any of the licensed companies.

X Q. 37. You have referred in your direct deposition to the Golding patent in suit, and to the defendants' machine and to various of the prior art patents which the defendants' expert has referred to I suppose you are, of course, perfectly familiar in a general way with the construction and operation of these various devices to which I have referred, are you not, Mr. Golding?

A. I am familiar with the cases so far as having read them, and as you state generally with the defendants' machine, but I never have seen any device relating to the Johnson patent, and do not understand that any ever was made or patented by Johnson, or others for carrying out his work.

X Q. 38. Please look at the drawing of the patent in suit, to which you have referred in your direct deposition, and say whether or not, you find therein any mechanism for actuating the upper cutter B and the lower knife C?

A. The lower knife C is not intended to be actuated; it is stationary, and may be of any size and width sufficient to resist ac-
42 tion of the upper cutter. The upper cutter as shown in
Figure 3 is a loose bar, which if taken in hand and placed upon the metal to be cut along the line of the face of the under cutter it may be forced over the metal cutting it, bending it and stretching it by the use of a hammer; in fact this is what I did in making the first piece of metal by this process with the exception that I used a chisel and hammer, the chisel being formed at its lower end like B in Figures 2, and with the further exception that I placed the sheet metal on which I was operating in a vise as before stated. Provided the under blade was an avail of sufficient weight, the natural thing to do would be to place the metal upon the anvil letting it overhang the width required for the strand, then holding the cutter with the hand resting upon the metal, strike it with the hammer the same as if a cold chisel was being used.

Of course the next operation would be to shift the metal longitudinally a distance representing one half the length of one of the cuts and setting it forward again to the width required to make another strand, and again employing the upper cutter as described. It is not necessary to shift the metal longitudinally, it may be simply set over the required distance for the width of the strand and the upper blade may be shifted to a point opposite to and over the uncut spaces left by the act of making the first row of cuts.

X Q. 39. I don't think you quite got my question, Mr. Golding, as I simply asked you where in the patent drawing any mechanism was shown for actuating the upper cutter as B; isn't it a fact that the Patent drawing simply shows said cutter as hanging in mid-air and no mechanism whatever is shown for actuating the said cutters?

A. The upper cutter may be held in position by hand and actuated as I described by hammer. The absence of any mechanism showing in the drawings to actuate the upper cutters is probably due to the

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43 fact that the actuating of upper cutters giving them an upward and downward motion is well known in metal shearing machines, such as punching with gang punches or a shearing of plates.

X Q. 40. It is a fact, is it not, that the patent drawings of the patent in suit fail to show or disclose any mechanism for operating the upper cutter B, isn't that so?

A. I think that is so.

X Q. 41. And it is also true, is it not, that the drawing of the patent in suit fails to show any mechanism for feeding and propelling the blank sheet A, isn't that true?

Mr. HUNTERS: Objected to as immaterial. Defendant's counsel apparently has lost sight of the fact that the patent is for a method or process of making expanded metal, and not a machine for carrying the process into effect.

A. Yes; that is true, but I made the first piece of expanded metal after I had proven what I could do with a cold chisel; with a cutter very similar to the one shown in the drawing, and I fed the metal over the under cutter by hand and held it there while operating the upper cutter, and produced a piece of metal very much like the drawing Fig. 1, excepting that I remember the cutters were somewhat larger and the meshes were somewhat larger.

X Q. 42. And is that the way you make your expanded metal at the present time under the allaged steps of the patent in suit, or have you gotten up some kind of a machine for doing this, Mr. Golding?

A. I invented and patented the machinery which now carries out this process. In some cases we shift the metal longitudinally and some times shift the knives longitudinally, that is the upper knives. In the latter case we have only to feed the metal forward, but do not have to shift the metal longitudinally.

X Q. 43. And is this machine, to which you have just referred, patented? and if so, have you any objection to giving me the date and number of the patent?

44 A. The patents are here, one of them is No. 581,713, dated May 4, 1897.

X Q. 44. And as I understand you, Mr. Golding, the patent to which you have referred in its drawing directly discloses the machine wherein the mechanical steps of the process of the patent here in suit are carried out?

A. With the exception that in the machine patent drawing there is shown the upper cutters in segments instead of being all made together in one piece as we sometimes do and use now in some of our machines, particularly where we make small meshes, and I should also except the difference in the form of the under knife which is hollowed out in front, so as to permit one style of feeding device to be used. On some machines we leave the face of the knife straight as shown in the process drawing and the sheet is fed over by other means than that shown in the machine drawing patent No. 581,713 referred to.

Defendant's counsel requests the Examiner to mark the patent last

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referred to "Golding Patent 581,713" for identification, and gives notice that he will refer to the same in his record, brief and argument at final hearing.

X Q. 45. And it is true, is it not, Mr. Golding, that the mechanical steps of the patent in suit which consist, first in simultaneously slitting and bending portions of a plate or sheet in such manner as to stretch or elongate the bars connecting the slit portions and body of the sheet, and secondly, similarly slitting and bending in places alternate to the first mentioned portions, are simply a recital of the operation or the function of the machine seen in the drawings of your patent 581,713; is that so?

Objected to as misleading, in view of the fact that complainants' patent in suit is dated October 9, 1894, and the machine patent is dated May 4, 1897, having been applied for May 20, 1896, it would obviously be more proper to say that the machine of said
45 machine patent is a machine designed for carrying into effect in
a commercial manner the method or process of the patent in suit.

A. At the time of the application for our patent for the process in suit No. 527,242, there was no machine in existence for producing metal by this process other than some simple blades such as those described in the process patent which I had fixed in a small punch and shearing machine in the works of the Northwestern Expanded Metal Co. in Chicago, and with which I produced the first expanded metal made by this process as samples to show those interested with me in the former patent as to what was possible to do by this new method. They cannot be a recital of a machine which did not exist.

X Q. 46. But after May 4, 1897, such a machine was disclosed to the public, and I again ask you Mr. Golding, if it isn't a fact that the two steps referred to in the claim of your patent in suit are not descriptive of the mechanical steps of the machine seen in the drawings of patent 581,713; isn't that so?

Objected to as misleading.

A. No, they are simply descriptive of the method employed to produce the expanded metal, and were not intended to refer to the machine as had not been made nor designed.

X Q. 47. Mr. Golding, assuming that patent 581,713 was granted a year or two before the patent in suit 527,242, is it not true that the steps recited in the patent in suit are simply a description of the operation or function of this machine?

Objected to as manifestly ridiculous, as the machine patent was granted and applied for long after the method patent. If counsel is really seeking information, he can readily obtain the answer by putting this question in a proper form without ignoring the fact that the machine was invented after the process.

46 Defendants' counsel objects to the uncalled for and improper comment upon the line of this cross-examination, and requests a direct and responsive answer from the witness, and requests the Examiner to read the question to the witness.

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Complainants' counsel merely calls attention to the question as a justification for his remarks.

A. I cannot assume or suppose that the description of the patent in suit was of any machine which did not exist, and had no existence.

X Q. 48. And in view of your last answer, Mr. Golding, I infer that at the time you made the application for the patent in suit and for a considerable period thereafter you did not have in mind any tangible, practical machine for carrying out the steps of the patent in suit, is that not so?

A. I did not have in mind the details, shape or size of a machine which we should build to carry out this process at the time of making application for this process patent, but I did soon after make cutters capable of producing larger meshes and for cutting heavier metal and did put these into what is known as the guillotine metal shearing machine and operated such machine in an experimental way to ascertain what was the best commercial form of product in following these steps, I applied such guillotine shearing machines with mechanism to shift the metal to the cutters.

X Q. 49. In carrying out the mechanical steps recited in the claims of the patent here in suit, the upper cutter the part lettered B in the drawings of the patent in suit, as well as the corresponding part in the drawings of your patent 581,713, always moves or reciprocates up and down, is that not so?

A. It always reciprocates up and down, and as before stated, in some of our machines it also has a lateral movement to avoid the necessity of shifting the metal.

47 X Q. 50. You are familiar, are you not, in a general way with the structure of the defendants' Bradford Machine as shown in the Bradford patent 664,379?

A. I am.

X Q. 51. If the upper rotary cutter D of the Defendants' Bradford Machine were substituted for the upper reciprocating cutter in your machine of patent 581,713, would the latter machine be operative?

Objected to as immaterial.

A. If the cutter in the Bradford machine were straightened out instead of being circular it would be similar to the cutter shown in my machine and operated, and they would be operative if raised and lowered vertically instead of being rotated, providing in both cases there was an under blade to resist their action, that is to support the metal while such upper cutter was passing over the lower cutter.

X Q. 52. But your machine would not be operative unless the various changes to which you have just referred were made after such substitution, would it?

A. I do not understand your meaning; it seems to me that changes and substitution refer to the same thing in your question.

X Q. 53. If Bradford's rotary cutter were substituted for the reciprocating upper cutter of your machine 581,713 and no other change is made in your machine, would your machine be operative?

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Objected to as manifestly indefinite as it does not appear from the question whether the cutters when substituted are to reciprocate as in the Golding machine, or are to be rotated in fixed bearings. Further the question is objected to as contradictory since the substitution in whatever sense it is meant could not be made without other changes.

A. If Bradford's rotary cutter were cut up into sections so as to make it possible to fix these sections into the upper reciprocating head of my machine they would perform the same operation as the cutters we use.

48 X. Q. 54. If the reciprocating upper cutter of your Golding machine were substituted in the place of the rotary serrated upper cutter of Bradford's machine, would defendants' Bradford machine be operative?

A. As before explained in some of our machines, that make the smaller meshes, we make many of these cutters on a single bar, and if this bar was bent to a circle and made to correspond to and fit upon the mandrel which carries the cutters as shown in Bradford's machine, it would be identical therewith, and its effects would be the same, the ends might be even welded together to produce the full circle if necessary.

X Q. 55. If the reciprocating upper cutter of your Golding machine were substituted in the place of the rotary serrated upper cutter of Defendants' Bradford machine and no other change made, would Defendants' Bradford machine be operative?

Objected to as indefinite.

A. Bradford's machine has no reciprocating head to reciprocate the cutters in a direct up or down line, but a gang of cutters such as I spoke of and which we sometimes use in our machine bent and formed to take the place of the cutters as shown in the Bradford machine and rotated as therein shown would act to cut, bend and stretch the metal between intersections of the uncut sheet same as shown in the patent in suit, with the exception that he does not work his cutters all upon the same line but on lines parallel to each other, and they operate at different times, and the construction of his machine is such that to make room for discs having many cutters upon their periphery, his machine requires to be of much greater length than it otherwise would be to produce the same result.

Answer objected to as volunteered and irresponsive.

X Q. 56. I did not ask in my last question for your views as to
the infringement or non-infringement of the patent in suit,
49 but asked a very simple question which can be answered
"yes" or "no," and I would ask the Examiner to read the
question to you, Mr. Golding.

A. I again repeat that the Bradford machine contains no reciprocating head into which cutters such as I have described in the patent in issue could be affixed, excepting such cutters were made, that is bent in circular form and placed upon the mandrel which holds the Bradford cutters.

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X Q. 57. Is your last answer to be taken as a negative answer to my X Q. 55, is it not?

A. Yes, it is a negative answer with the conditions appended.

X Q. 58. The complainants' machine in which the mechanical steps of the patent in suit are carried out has a reciprocating head which carries the upper set of the cutters and this head is reciprocated up and down by means of an eccentric and intermediate connections, that is a correct statement, is it not?

A. That is a correct statement, with the exception that I have explained that in some cases we also give the upper cutters the horizontal reciprocating movements to avoid the shifting of the metal longitudinally.

X Q. 59. And the defendants' machine has a series of upper cutters which are serrated and rotate and have no up and down reciprocatory movement, is that not true?

A. The upper cutter in the serrated disc or cutter shown in the Bradford machine gets to its lower position by swinging around the half circle instead of being actuated directly downward as is shown in the patent in suit. In other words it gets there, that is to the metal, and performs the action in a very similar way to what it would if it was forced down upon the metal, with the exception that the downward pressure and stretching is performed by the cutter upon part of the metal somewhat in advance of its operation upon the opposite side of the cutter, but in both cases the cutter cuts, bends and stretches the metal into the position as shown in the product made by the Bradford machine.

X Q. 60. I understand your last answer to be taken as being in the affirmative to my question, is that right?

A. It is true, and I made the explanation which I did only to illustrate it that these cutters each finally took the position and performed the same act that they would if reciprocated vertically.

X Q. 61. The defendants' machine has a set of lower rotary cutters, whereas the complainants' machine employs a stationary non-rotatable cutter, is that not so?

A. That is correct.

X Q. 62. Reference has been made by you to the patent to Ohl No. 475,700, granted May 24, 1892, do I understand you to assert that the slit or severed strand of the metal such as seen in Figs. 10 and 11 of said patent is not cut, bent and stretched?

A. I did not say they were not cut, bent and stretched. In fact in my direct examination in the first place I said they were, but not to produce expanded metal, nor do they produce expanded metal or any metal to correspond with the metal described in the patent in suit. I would say in my direct examination I had this in mind when I answered X Q. 49 in my former deposition.

X Q. 63. Please look again at the drawing of the Ohl patent and see if it is not a fact that the steps of slitting, bending and stretching portions of a sheet seen in said patent are performed simultaneously?

A. They are, but always within the sheet leaving uncut portions of the metal intact and the sheet in the same plane as before the operation, and it does not cut from or along the edge of the sheet as

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is necessary to do to produce expanded metal by the cutting, bending and stretching process as described in the patent in issue, and it does not increase the superfinal area of the sheet operated upon.

51 X Q. 64. Isn't it true, however, Mr. Golding, that the claim of your patent in suit does not say a word to the effect that this cutting or slitting, bending and stretching operation must be performed along the edge of the metal sheet. The claim does not specify that it must be along the edge of the sheet or in the body of the sheet, isn't that so?

A. The claim specifies that it is a method of making expanded metal and the Ohl patent does not make expanded metal. Further the claim refers to the method described in the patent and which shows the cutting is done along the edge, that the metal may be free to expand and enlarge the area of the sheet.

X Q. 65. As I understand the term "expanded metal", you have given it a sort of a fanciful designation in your business and consider that it must mean metal having diamond-shaped recesses in it, isn't that so, Mr. Golding?

A. No, that is not correct. My process does not confine itself to diamond-shape openings, as we have made them oval, but it distinctly relates to a sheet of open metal work the area of which is greater than the area of the blank from which a sheet of metal was made, and as to a fanciful definition I think it is only fair to say that the manufacturers of such metal as is shown in the Ohl patent have in some instances appropriated the name "expanded metal" for the evident purpose of introducing their goods into a well established trade. This is instanced in the case of herring-bone lathing which they term "herring-bone expanded metal." This latter metal is cut and pulled open and rightly termed expanded metal, as we have no copyright on the word "expanded metal" to pervent this appropriation by others.

X Q. 66. And in view of your last answer it is a fact isn't it that the product of the Ohl machine we have been talking about has been in some instances designated as expanded metal, isn't that so?

52 A. It was not designated as expanded metal until within the last three years. It was originally called Bostwick Steel Lathing, bearing the name of the gentleman who acquired the use of the patent.

Adjourned to Friday, Sept. 9, 1904, at 10.30 A. M.

FRIDAY, *September* 9, 1904, at 10.30 A. M.

Met pursuant to adjournment.
Present as before.

Cross-examination of the witness, JOHN F. GOLDING, resumed.

By Mr. FAIRBANKS:

X Q. 67. The Expanded Metal Company, one of the complainants herein, is a sort of a trust, is it not, and controls numerous patents for making the product under consideration; is that not so?

Objected to as incompetent, irrelevant and immaterial.

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A. I cannot understand why the term "trust" should be applied to the Expanded Metal Co., as it holds no share in either of the Companies manufacturing expanded metal, and such companies are only licensees, and I believe the only patents which it holds are those which I have taken out following my inventions and assigned to it.

X Q. 68. If you have no objection, please give me the names of the different concerns in the United States who are to-day engaged in the manufacture of open or reticulated metal sheets or lathing besides the complain-t Company?

A. The complainant Company, as stated is not a manufacturing Company, that is The Expanded Metal Company. The various Companies manufacturing expanded metal under license from The Expanded Metal Company are Messrs. Chess Bros., of Pitts-
53 burg, one of the complainants in this suit, The Northwestern
Expanded Metal Company, of Chicago, The Eastern Expanded Metal Company, of Boston, and the Western Expanded Metal Company, of San Francisco. There is one other licensee, but they are not manufacturers, preferred instead to purchase of other of our licensed manufacturers.

X Q. 69. What other concerns are there in the United States, Mr. Golding, who are making sheet metal lathing, besides the concerns you have just enumerated?

Objected to as incompetent, irrelevant and immaterial.

A. I could only answer this question, so far as my knowledge relates to the subject, and I might enumerate the manufacturers of herring-bone lathing of Youngstown, Ohio, the Corrugated Iron & Steel Roofing Company, manufacturers of what is known as the Fordyce lath of Youngstown, Ohio. I have heard that there is a factory at Waukesha, Wisconsin, manufacturing lathing, but I have not seen their works and in fact neither of the others referred to. Besides these I know by repute only of those making sheet metal lathing of the Ohl variety, but I do not know where they are made nor the official title of the manufacturing companies or firm.

X Q. 70. And the parties who are manufacturing the Ohl sheet metal lathing are manufacturing the same form of machines conforming to the Ohl patent; is that not so?

A. I have not been to the works where any of the Ohl patent lathing is manufactured, consequently have not seen their machines, but I should judge from samples of the lathing which I have seen that they were made according to the process described in the Ohl patent, which simply represents a sheet of metal with loops forced in it at intervals, having the area and size of the original sheet undisturbed.

X Q. 71. The machine seen in the Ohl patent No. 475,700
54 simultaneously slits, bends and stretches portions of a plate
or sheet of metal and then similarly slits and bends in places alternate with the first mentioned portions, is that not so, Mr. Golding?

A. It is so, and such slit and bent portions are always apart from each other, leaving undisturbed metal between them, both longitudinally and crosswise of the sheet.

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X Q. 72. You are familiar, as I understand, with the British specification to Thomas Long, No. 2125 granted in the year 1862, a third of a century prior to the date of the patent in suit, are you not?

A. I have read it. My attention was first called to it by a Mr. Blodgett who was an Examiner in the United States Patent Office at Washington some two or three years subsequent to the issue of my original 1884 patent, and that was the first knowledge I had of the Long specification.

X Q. 73. Did you personally have any connection directly or indirectly with the litigation reported in 111 Fed. page 395, wherein the said Court of Appeals of the Eighth Circuit, declared your patent No. 297,382, granted June 10, 1884 invalid in view of this British patent to Long?

A. The Expanded Metal Company was a party complainant to that suit. I was a shareholder and Director in that Company, which I still am, but I was not in this country at the time of the taking of any evidence or of argument made in the case, though I may answer that the only connection I had with it was a shareholder of the Company.

X Q. 74. And I suppose that litigation I have just referred to wherein your 1884 patent was declared invalid was conducted in good faith on both sides so far as you know, was it not?

A. It was.

X Q. 75. And the Circuit Court of Appeals for the Eighth Circuit
in that case decided in substance that you were not a pioneer
55 in the manufacture of this open metal work, metal lathing or
expanded metal as it is variously termed, is that not true, Mr. Golding?

Objected to as incompetent, in that the decision of the Court of Appeals is the best evidence of what that Court decided.

A. I do not understand that the Court decided that I was not a pioneer in the manufacture of expanded metal open work, as there was not produced and I believe it would have been impossible to produce, any expanded metal at that time except such as was being made under my patents, but I understand what it did decide was that the Long provisional specification was a disclosure of a method of cutting and opening metal sheets. I would say that what I mean by no other method being possible in evidence at that time excepting such as was made under my patent, I of course exclude the infringing metal which was the cause of the action and which was made under the Fordyce patent before referred to in my testimony in this case.

X Q. 76. In the litigation to which I have just referred, wherein your 1884 patent was declared invalid, was there any attempt made to remove that cause to the Supreme Court of the United States by a petition for the writ of certiorari, or was the decision of the Circuit Court of Appeals accepted as final?

A. I think no such application was made, and the co-directors of my Company were of the opinion that it was not worth while to appeal the suit because the life of the patent upon which the suit

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was brought would soon expire and further only a limited quantity of what was then claimed to be infringing goods was being then produced.

X Q. 77. Is not the term "infringing goods" that you have used in your last two answers somewhat of a misnomer, Mr. Golding, in
view of the fact that the Circuit Court of Appeals for the
56 Eighth Circuit decided your 1884 patent invalid, and held
that it was a common right or public property in the United
States to manufacture expanded sheet metal by slitting and stretching the same?

A. If you would read my previous answer you will see that I state "of what was then claimed to be infringing goods."

X Q. 78. The decision of the Circuit Court of Appeals for the Eighth Circuit, wherein your 1884 patent was held invalid, in view of the British patent to Long of 1862 in effect authoritativly decided that anyone in the United States had a right to make this expanded sheet metal by the steps of alternately slitting a sheet so that the slits would stand in staggered order or break joint with the adjoining row of slits and then stretching the sheet so slit, is that not so?

A. I think the decision of the Court is the best answer to the question, and do not think I should be called upon to elucidate its meaning.

X Q. 79. Question repeated.

Question objected to as incompetent, as the witness is not called upon to interpret the opinion of the Court which speaks for itself. The opinion of the witness with regard to what it means is wholly immaterial.

Mr. Fairbanks objects to the complainant's counsel attempting to coach the witness on the record under the guise of making an objection, and request- and directs a responsive answer to the question.

A. I understand that to be the meaning of the decision of the
Court limited to the cutting as described and to the stretching of
the sheet open, but this has no relation whatever to the stretching
of the metal composing the bars which form the meshes, nor has it
any relation to the simultaneously slitting and opening of the sheets
to form open metal work, nor has it any relation to the act of
simultaneously slitting, bending and stretching of the bars so cut
to form open metal work. Neither of these latter methods
57 were in issue in the case, so far as my knowledge goes.

X Q. 80. Prior to the date of the patent in suit, it was old to manufacture open metal work or expanded metal by the steps of slitting a plate or sheet of metal and afterwards stretching or opening out the slitted sheet or plate by means of suitable mechanical devices, such as a former or mould if desired, is that not so?

A. It was old as set forth in my original 1884 patent, but all such methods of slitting the sheet and stretching the sheet open shortened the product to the extent required to open such metal.

X Q. 81. In the specification and drawing of the British patent to Johnson No. 11,332, of 1885, wherein the antiquity of produc-

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ing expanded metal by slitting a plate or sheet of metal and afterwards stretching or opening out the slitted plate by means of a suitable former or mould or other mechanical devices is fully disclosed, do you find any statement in the specification or anything in the drawings of this patent stating that the metal is shortened during these mechanical steps, is it not a fact that the drawing of the patent shows the blank in Fig. 1 and the finished product in Fig 2 as exactly of the same length, you can measure them if you wish.

Objected to as improper cross-examination.

A. The drawing in Fig. 1 in the Johnson patent referred to was inadver-ently incorrectly made. The specification of the patent nowhere refers to the finished product being of the same length as the blank sheet, nor does it anywhere refer to the stretching of the bars between the intersections of the metal connecting them, but simply refers to the pulling of the metal open at the incision and which would have made the product shorter than the blank sheet. Therefore Figure 1 should have been made longer as a whole, and the cuts
within it made longer to provide for the opening of the sheet,
58 or Figure 2 should have been made shorter as a whole, that
is its length should have been contracted to correspond to the
pulling open of the sheet.

X Q. 82. What is it that is stretched in the production of the expanded metal sheet disclosed in the drawings and specifications of the British patent to Johnson of 1885, if it is not the bars connecting the slit portions and body of the sheet or plate?

Same objection.

A. It is the opening of the metal in one direction and the shortening in the other direction, which permits the sheet to be drawn out to represent a larger superficial area of the finished article than the superficial area of the blank sheet. It is on the principle of stretching open the lazy-tong system of gates, such as are used commonly on ferryboats, railway trains, and sometimes used for hat racks. It is drawing apart of the several portion, the contracting of the metal otherwise permitting of such stretching open.

X Q. 83. And I understand you to deny that the bars connecting the slit portions and the body of the sheet or plate in Johnson British patent of 1885 are stretched, in spite of the fact that the British patentee asserts that they are? Is that correct?

Objected to as a manifest misstatement of the British patent referred to.

A. I have already stated that the patent nowhere discloses the elongation or stretching of the bars between the intersections of the metal connecting them, as the patent itself is the best evidence.

X Q. 84. I do not think you have yet made yourself very clear Mr. Golding, as to your understanding of the stretching operation of Johnson's British patent of 1885, and I will read lines 37 to 40 to you.

"This pulling or stretching or opening out of the slits or slots may be affected by means of any suitable stretching apparatus;"

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59 Now please tell me once more what it is that is stretched in Johnson's structure, if it is not the bars connecting the slit portions and body of the sheet?

Objected to as improper cross-examination.

A. He clearly uses the word "stretching or opening out" of the metal at the slots as alternative words, meaning the same thing, the parting of the metal at the slots and the stretching of them open, the words themselves out of the patent as you have read, give a very clear definition to his meaning.

X Q. 85. If the bars connecting the slit portions and body of the sheet in Johnson's device are not stretched somewhat, then how in the world did Johnson finally get the structure seen in Figure 2 of his patent No. 11,332 of 1885?

Same objection.

A. As I clearly stated he nowhere claims in his patent the stretching of the bars, and as I have also shown either Figure 1 or Figure 2 in his drawings was incorrectly made. The draughtsman undoubtedly undertook to show what metal so cut and opened out would look like irrespective of the length of the sheet. He does not show the slit sheet opened out in its entirety, only a portion thereof, and in any event the drawings are incorrect as I have before stated in that the measure of the cut longitudinally between the intersections of the opened out metal are the same as the length of the longitudinal cut in Figure 1.

X Q. 86. I will read you claim 1 of the Johnson patent which reads as follows:

"The manufacture of open metal work for use as trellis work, lattice-work, ceiling or other purpose by slitting or slotting a plate or sheet of metal and afterwards pulling, stretching or opening out the slitted or slotted sheet or plate substantially as hereinbefore described."

60 Are you not very much in error in stating, as you did in the first part of your last answer, that Johnson does not claim in his patent the stretching of the bars?

Same objection, and furthermore because the claim speaks for itself.

A. He certainly does not. The words of the claim "pulling, stretching or opening out" are clearly synonomous words. The pulling means to pull the metal apart at the slit, the stretching of the sheet open, that is the opening of the sheet by the means of pulling it apart at the slits.

X Q. 87. And when the sheet is opened it is not stretched, is that what you assert?

Same objection.

A. I assert that the commonest thing in the world to call any article consisting of two pieces of metal or even string connecting at both ends stretched open when these two parts are separated and drawn away from each other at points anywhere between said con-

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necting ends, as I have illustrated already by the lazytong gates, and this is clearly what Mr. Johnson meant by stretching.

X Q. 88. So you think that Mr. Johnson, the British patentee has shown his structure in his drawings erroneously and he has also used the term stretching erroneously, do you?

Same objection. The question is further objected to containing two questions in one.

A. I repeat that the drawings were made incorrectly; that he used the word stretching correctly when applied to what he actually did, which was to stretch the sheet open at the slits.

X Q. 89. Look at Figure 1 of the drawings of Johnson's British patent of 1885 after the sheet has been treated to produce the
61 structure seen in Fig. 2, do you assert that the sheet has not been stretched, in the face of the fact that Mr. Johnson so describes it and claims it?

Objected to as improper cross-examination.

A. Presuming that Fig. 1 of the Johnson drawings to have been correctly made, it means that to produce an article such as described in Fig. 2, the sheet metal represented by Fig. 1 would first require to have been stretched longitudinally after the cuts were made so as to have given the length to the whole sheet and to the cuts sufficient to permit of the sheet so stretched being opened out and again contracted by such opening out to represent an article such as describing Fig. 2. Nowhere is such preparatory longitudinal stretching of the sheet assumed, and it would be commercially impractical to do so, as it would require force equal to the resistence of the tensile strength of the whole metal in the sheet to so stretch it, and the stretching would be irregular according to the varying thickness of the steel in the plate. Johnson particularly states after the slots are made in the sheet metal it is pulled open at the incision.

X Q. 90. Mr. Golding, you have answered everything excepting the question I asked you, which is very clearly put, and I will repeat the question, and ask you to answer it as responsively as possible to shorten this thing up.

Question repeated.

Same objection, and furthermore because the answer is fully responsive.

A. He stretches the sheet open as and by the method explained, that is first slitting it, then pulling the sheet apart at the slits, stretching it open in one direction and contracting it in the other direction to provide for such stretching open.

X Q. 91. Where in the specification or drawing of the Johnson British patent, which is the highest source of authority on
62 the subject, do you find the warrant whatever for the assertion in your last answer that any contraction takes place. Please refer me to the lines and page of Johnson's specification wherein you think any such assertion is made. If you cannot find any such warrant for this assertion, will you kindly so state on the record?

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Objected to as improper cross-examination.

A. In the absence of any statement, description or claim that the strands or bars connecting them at their intersections have in any way been stretched or elongated, the contraction of these intersections during the act of opening out the sheet is the natural and inevitable result.

X Q. 92. My last question was a request for you to indicate where in the Johnson specification there was any statement made to the effect that any contraction of the sheet took pace while it was being stretched. I understand your last answer to be in effect that you can find no such statement in Johnson's specification; is that not true?

A. It is plainly implied by the absence of any reference to the bars being elongated or stretched to provide for the necessary opening to avoid the shortening of the sheet.

X Q. 93. As a matter of fact, isn't it true that all the statements which you have made to-day with regard to the contraction of the finished product of Mr. Johnson's device and your assertions that Mr. Johnson did not understand his invention or the use of the term stretching, and that he has shown his drawing wrong and incorrectly, simply notions or theories of your own that you have evolved for the purpose of making the Johnson method of manufacture appear slightly different from the mechanical steps recited in the claims of the patent in suit, isn't that about the plain English of it?

Same objection, and further because the statement that the witness has asserted that the patentee Johnson did not understand 63 his invention or the use of the term stretching is unwarranted by the facts and contrary to them.

A. My statements have been made to show just what the result would be following the method described by Mr. Johnson, and what I know from practice to be the result of doing what Johnson sets forth in his description of his method, and certainly to show that his method was entirely dissimilar to the method practised under the process of the patent in suit.

Recess until two o'clock.

(Witness continues his answer).

I do not say that Johnson used the word "stretching" incorrectly when applied to stretching the sheet apart at the incision. The word "stretched" is used in both the Long provisional specification of 1862 and in my own original patent of 1884, to describe the pulling open of the sheets at the slits. The Long specification does not refer to the contraction of the sheet in the opposite direction from the pull, neither does my patent of 1884 mention in its text the shortening of the sheet because of its being pulled open, but the drawings show that effect correctly.

X Q. 94. You mean by your 1884 patent, the patent No. 279,382, granted April 22, 1884, which was held invalid by the Circuit Court of Appeals for the Eighth Circuit?

A. That is the patent I refer to.

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X Q. 95. Please look at Figure 2 of the drawing of Johnson British patent of 1885; the finished product seen therein is a marketable and merchantable sheet, is it not?

Same objection.

A Figure 2 as drawn shows the surface of the original sheet the width of the strands and intersections, but shows no thickness whatever of the metal plate. It is simply a line drawing so far as thickness is concerned, but it was intended to represent a piece of metal of
some thickness and length that had been cut and opened out,
64 but the thickness is not given, neither is the original length
of the metal in this figure, but as before stated Figure 1 would be an incorrect representation of a metal blank for the production of Figure 2.

X Q. 96. Mr. Golding, I did not inquire as to your notions as to the correctness or incorrectness of Mr. Johnson's drawing, I will ask the Examiner to read the question to you once more, and request that you kindly make a direct and responsive answer?

A. I said I have no doubt that it was intended to represent a marketable and merchantable sheet had the Figure shown any thickness of metal.

X Q. 97. Mr. Johnson states in his specification as follows:

"The length or size of the slits or slots and their distance from each other, as well as the kind of metal and thickness of the sheet employed may be varied according to the quality and purpose for which the article to be produced is to be used."

This statement coupled with the showing of Johnson's Figure 2 makes it perfectly clear to you as one skilled in the art that the finished product of the Johnson patent is a perfectly marketable and commercially merchantable expanded metal sheet, is that not so?

Same objection.

A. The length and size of the slit or slot as set forth in paragraph 10 of the Johnson specification relates to the length and size of such slits or slots in the blank sheet from which the article is to be produced. The figure 2 in Johnson's specification, providing it represented some thickness of sheet, would of course represent a commerical article. In your question it would seem that you mean that the slits or slots in the finished article determine the necessary size to produce the necessary length. The Johnson specification does
not indicate this except in the drawing, which I have stated is
65 manifestly incorrect, in the matter of the length of the cuts
in the blank necessary to produce the opening shown in Figure 2.

X Q. 98. In the machine shown in your 1897 patent No. 581,713, wherein as I understand it the mechanical steps recited in the claim of the patent in suit are carried out, it is a fact, is it not, that the finished expanded sheet is always of precisely the same length as the blank before it is treated?

A. You ask me if they are precisely the same length; my answer is that they are practically of the same length and precisely the same length between the first intersections at either end of the sheet. By observing Figure 1 of the drawings in this case, it will be observed that the length of the mesh is obtained by simultaneously cutting, bending and stretching the metal away from the original plane of the sheet to produce one-half of the diamond-shape mesh. There is consequently no contraction or elongation of the distance between that portion of the metal which connect these bars or strands to the uncut plate. The next operation of simultaneously cutting, bending or stretching is done at the point indicated by the dotted lines back of and opposite to the intersection, and such act has no effect whatever upon the first described act. The only difference, therefore, in the len-th of the blank sheet and the finished sheet that can occur will be in the effect the machine would have upon the extreme end meshes of the finished product. If the steel used was very hard, but not too hard to cut, there might be a slight tendency for the metal to spring together when the whole sheet was cut, which would cause a slight elongation of the finished product beyond the length of the plate from which it was made.

X Q. 99. And then the substance of your last answer is that in carrying out the mechanical steps recited in the claim of the patent in suit, the finished product is in practice slightly longer than the blank, isn't that the plain English of it Mr. Golding?

66 Complainant's counsel objects to the statement in the previous question and the repetition in this that the machine of patent 581,713 carries out "the mechanical steps recited in the claim of the patent in suit" as an attempt to inject an argument into the questions, and therefore unfair.

A. I did not say that the finished product was always longer; I said it might in case the metal of such a nature as to spring backward or slightly close the opening. In practice we do not observe any difference in the length of the finished product different from that of the plate from which it is being cut, and we never have made such a claim.

X Q. 100. From your last answer I would infer that the greater or less ductility of the sheet which is being treated has something to do with the finished product being longer or shorter than the blank after the latter has been run through the machine of your patent 581,713, wherein as I understand it, the mechanical steps of your patent in suit are carried out, will you kindly state the facts as to this?

Objected to as a misstatement of the testimony of the witness.

A. There is no material difference in the length of the finished product and the length of the sheet from which it is made, and we never had occasion to take notice of the inconsiderable lengthening or shortening of the sheet. I only referred to the matter in the theoretical sense, that if the metal was very hard and had a tendency to close up the meshes the product would be slightly longer, but this possibility of lengthening or shortening the product, as I have stated, is of no practical moment.

X Q. 101. Is the finished product from the machine of your patent 581,713 which we have been talking about, usually longer or shorter than the blank, or don't you know?

A. It is usually the same length within the fraction of an inch,
that is to say, that a sheet of metal 8 feet long made into
67 expanded metal by the process described by the patent in
issue and with a machine 581,713 does not vary to exceed
3-16 of an inch in length from that of the sheet from which it is made, and as I already stated, such variation is chiefly attributable to the action upon the metal at the point nearest either end of the sheet and outside of the first intersection of the strands.

X Q. 102. Have you ever known of any instances wherein a blank having been mechanically treated in the machine of your patent No. 581,713 was longer than the so-called expanded metal product, after being so treated?

A. I will again explain that the end cuts of the machine may sometimes distort the shape of the end meshes so as to make the finished product slightly shorter than the blank from which it was made, but this shortening is confined to the end meshes of the finished product line due to the bending of the bars out of a straight line due to the contract of the cutter against the end of the metal as shown at the extreme right hand side of Figure 1 where it indicates the beginning of a dotted line.

X Q. 103. In view of your foregoing answers, it is a fact, is it not, that this occult and mysterious step of "stretching" referred to in the patent in suit, and the concluding limitation of the claim in the patent in suit, to the effect that the finished expanded sheet of metal is of the same length as that of the original sheet or plate, are all absolutely meaningless and devoid of weight in practice, for the reason that, as you have very clearly explained, according to the ductility of the blank and some action or another of the machine in which the mechanical steps of the patent in suit are carried out, the finished product is just as likely to be longer or shorter than the blank, isn't that so?

A. I have tried to make it clear that the slight differences either way are so small as to be of no practical moment, and I did this in
my former answer wherein I recited that in a sheet of 8 feet
68 in length the finished product would be within a fraction of
an inch of the same length as the blank from which it was
made.

X Q. 104. Have you in mind one single instance wherein the finished product of the blank run through the machine of your patent 581,713 was of precisely the same length as the blank, or don't you know?

A. I have already answered the question, and stated that with the exception of the possible deformity of the meshes of the extreme end of the sheet, the length of the finished metal is the same as the blank sheet from which it is cut, and it would remain precisely the same length, provided there was no pressure exerted to close up the meshes.

X Q. 105. When did you first see or hear of the British patent to Johnson No. 11,332 of 1885?

A. The existence of such a patent was mentioned to me by some one I think in about the year 1896 while I was in England, but I confused the name Johnson with a manufacturer of wire-work at Manchester, and supposed it was something relating to wire-work and did not look the patent up I would say, except this may be a patent which was referred to in 1888, wherein parties undertook to vend such a patent in England and were estopped upon the discovery of my prior patent, but I do not now remember in whose name such patent stood.

X Q. 106. Did you or anyone directly or indirectly connected with you or the Expanded Metal Co. take any steps or make any effort to acquire the British patent to Johnson No. 11,332 of 1885 ever at any time?

A. I did not, and no one connected with me did to my knowledge.

X Q. 107. You have referred in your direct deposition to the fact that you have some thirty machines on the continent making expanded metal, as well as in the United States are these machines constructed in substantial accordance with your patent 581,713?

69 A. Your statement is incorrect, in that I said there were some thirty machines in England and on the continent, and that there were some twelve machines in operation in the United States. They are similar in effect to the machines described in the patent 581,713, with the exception, as I have already explained, that some of the machines had longitudinally reciprocating upper cutters, and that they are varying in feeding devises used, some different from the ones shown in this patent.

X Q. 108. You used an old or a dull pair of cutters in producing Exhibit No. 13, Sample E of Old Process, did you not?

A. I did not see Sample E made, but I should judge the cutters were in fair condition. The burr which is shown upon the metal would be due to the cutters not being set very closely together.

X Q. 109. Who did make Sample E, and what do you know personally of your own actual knowledge as to this specimen?

A. Sample E was made by Messrs. Chess Bros., of Pittsburg, on what is termed their 4-inch machine. The mesh is about 4 inches if measured parallel with the strand. This piece of metal was given me by the representative of the firm of Chess Bros., and I believe is the only one of our old process machines in existence which produced a 4-inch mesh.

X Q. 110. That is all you know about this thing then, is it, that a representative of this concern Chess Bros., away out in Pittsburg, gave you this specimen and told you that it was made under some old process or another. You yourself, personally, did not see the thing made and have no personal knowledge whatever of it, is that so?

A. The representative of Chess Bros., did not say it was made by some old process or another. I know the metal was made on Chess

Bros.' machine, because of the size of the mesh, the peculiar
70 crooks and the strands or bars forming the meshes and from
having seen a great deal of the metal made by said machine
in their works at Pittsburg.

X Q. 111. On what day of the month and what time of the day and in whose presence and by whom was the sample E made?

A. By the representative of Chess Bros., more particularly described as their assistant Works Manager, Mr. Moody, whose initials I do not remember. I would say that about half-past nine o'clock or ten o'clock in the morning of the 17th or 18th of August at our offices in Chicago, in the presence of Oscar Bradford, President of Expanded Metal Co., and also at the offices of Mr. Munday, Evarts & Adcock, and in the presence of Mr. Munday, and Mr. Evarts of said firm, and while Mr. Bradford before mentioned was present.

X Q. 112. Then Sample E was made in Chicago and not in Pittsburg, is that what you mean by your answer?

A. I have not indicated any such thing, but I have said that this was made in Pittsburg by Messrs. Chess Bros., and that it was handed to me by their representative Mr. Moody in the presence of the parties named. By being made in Pittsburg, I mean, more specifically, that it was made by Messrs. Chess Bros., at their works at Rankin, a suburb of Pittsburg, where Mr. Moody is the assistant Works Manager.

X Q. 113. So Moody in Pittsburg is the man who actually personally made Sample E, and then Moody took it to Chicago, and then you brought it from Chicago here, is that right?

A. That is right.

X Q. 114. Did you see Sample D complainant's Exhibit No. 12 made personally?

A. I did not, but I have seen a great deal of such metal made in the works of the Northwestern Expanded Metal Co., at Chicago, and recognize it to be made upon what is known as their 2½ inch machine.

71 X Q. 115. Did you personally see Sample B and Sample F made, or did Moody make these two out in Pittsburg and bring them to you in Chicago, and then you brought them here?

A. Sample- B and F were both made in the works of Chess Bros., at Rankin. I did not see them personally made.

X Q. 116. And how about Sample G, Sample A; did you see them personally made?

A. I did not.

X Q. 117. For all you personally know, Mr. Moody might have picked these various specimens out of the scrap and brought them to you in Chicago, is that so?

A. This would not prove they were not made by Chess Bros., of Pittsburg, as I know they were made by my machine under patent 581,713, because of my knowledge of the size and mesh such machines produced, and being familiar with the product of such machine.

X Q. 118. How does it happen that the Exhibits B, F, and G, which purport to represent the mechanical steps of the patent in suit

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were apparently cut or sheared with such nice sharp cutters or knives, whereas the two specimens D and E which purport to represent samples of some old process, whatever it is, are such horrible looking jobs, and were apparently cut with old, dull cutters or possibly by hand with a cold chisel; was it to give the Court the impression that the alleged new process sheared the metal so much cleaner and smoother, so as to make a better-looking job?

Same objection as to X Q. 99, and furthermore because the statements contained in the question are unwarranted by and directly contradictory of the testimony which has been given with reference to the said Exhibits.

72 A. Samples D and E are fair specimens of the product of my machine No. 381,230. I have seen large quantities of it of which this is a fair specimen, as I am sure that the specimens were not deformed for the purpose of misleading the Court, as I may say that Sample D was brought here by me from the office of Munday, Evarts & Adcock after having been in their office a number of months, and was not selected in any sense with a view of being presented here other than as the regular product of such machine. The imperfections in the manufacture are incident to the setting and regulating of the cutters.

As to Samples G, F and A, they are in no way unusually well done and certainly no one would say that Sample F had been prepared for this occasion. Sample G was made with a view of illustrating the action of the cutters when making its incision immediately back of the intersections of the strands already formed. I have seen and personally supervised the manufacture of large quantities of expanded metal made by machines carrying out this process, wherein it was equally as well cut as the sample.

In view of the foregoing admissions of the witness, to the effect that he has no personal knowledge and did not personally see made Sample A, Sample B, Sample G, Sample D, Sample E and Sample F, defendants' counsel gives notice that he will on or before final hearing move to strike all the testimony relating to these alleged exhibits as well as the exhibits themselves from the record for the reason that they are incompetent, immaterial and irrelevant and unidentified by any witness having personal knowledge of their production.

Defendants' counsel further before concluding the examination of the witness objects to the offer of Complainants' Exhibit No. 11, marked Model Golding Process, for the reason that the same does not appear to conform to any of the patents referred to by the complainant or defendant and is therefore obviously incompetent, irrelevant and immaterial.

73 X Q. 119. Mr. Golding, will you please produce at a session to-morrow before the Examiner, subject to the consent of your counsel, a full-sized blank and also an expanded sheet from a blank of the same size which has had applied to it the mechanical steps recited in the claim of your patent in suit which I understand it are in practice performed in the Golding patent 581,713?

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Same objection as to cross question 99. Complainants counsel states that no doubt a full sized sheet of expanded metal of the character referred to in the question can be obtained and produced by to-morrow morning, but that he does not think it will be possible to have the corresponding blank here at that time, as none of the expended metal is manufactured nearer than Pittsburg, but he will, as soon as possible, obtain such a blank.

Mr. Fairbanks states on the record that in case the exhibits referred to are produced and offered in the regular way he desires the same to be properly identified by a witness produced in the regular way for direct and cross examination.

Cross-examination closed.

Redirect examination.

By Mr. HUNTER:

R. D. Q. 120. In your answer to X Q. 53 in your deposition in chief you were asked whether your patent in suit was the first disclosure of a method or machine for making open or reticulate metal work by cutting parallel alternately disposed slits in a sheet and bending the slitted metal to open it and produce an expanded sheet of the same length as that of the sheet before this final bending or expanding operation. In your answer to this question you refer to the preceding question X Q. 52, and say "I should, therefore, have "answered the question in the negative." As your answer does not appear to me entirely clear, I would ask you if you have any explanation to make with reference to your meaning?

Mr. Fairbanks objects to the question as being obviously
74 improper re-direct examination and as furthermore leading
and suggestive, and further protests to defendants' counsel attempting to patch up the witness's previous deposition with questions of grossly suggestive character.

A. In my answer to question 53 I stated that I was afraid I could not distinguish the difference between that question and question 52. I now have to say that the last sentence to my answer to question 53 is evidently inconsistent to the main answer. This last sentence referred to should have concluded with the word "affirmative." As I now understand the question it relates to the cutting alternately disposed slits in *parallel* lines and bending the strips of metal to open it so as to produce expanded metal sheets of the same length as the sheet before the final bending and opening operation, and I wish to make it clear that the patent in suit was the first disclosure of a method of making expanded metal wherein the length of the product remained the same as the sheet from which it was made, and wherein the superficial area of the sheet was enlarged in a transverse direction to its length.

R. D. Q. 121. You have said that in making a sheet of expanded metal under the process of the patent in suit from a blank 8 ft. in length, the product would be of the same length as the original blank within possibly a variation of 1-16 of an inch?

Same objection.

A. No, I said a possible variation of 3-16 of an inch and that would be due wholly to the deformity of the end meshes in such finished shape, if such deformity occurred, otherwise the sheet would be almost exactly the same length, depending on whether or not the two end knives of the machine encountered the metal at the intersection in such a way as to bend it, thereby shortening the end mesh.

R. D. Q. 122. In forming a sheet of expanded metal from a blank 8 ft. in length under the old process or with a machine of the
75 character shown in your patent 381,230, how much would the finished product be shortened with reference to the original blank?

Same objection.

A. About fifteen per cent.

Re-direct examination closed.

Adjourned until Monday, September 12, 1904, at 11 A. M.

MONDAY, *September* 12, 1904—11 a. m.

Met pursuant to adjournment.

Present as before.

RUDOLPH M. HUNTER, called as a witness, having been duly sworn, testifies as follows in answer to questions——

By Mr. HUNTER:

Q. 1. State your age, residence and occupation?

A. 47 years; Philadelphia, Pa.; mechanical engineer and solicitor of patents.

Q. 2. What training and experience have you had in the mechanical arts and sciences, and particularly with reference to construction and use of expanded metal, that may qualify you to testify as an expert in this case?

A. I am professionally educated in the arts and sciences, and as a mechanical engineer have designed and constructed and superintended the construction of a great deal of machinery and engineering work in general. I am familiar with the construction and use of expanded metal such as involved in this suit. I have been engaged in the patent business since 1871, and have prepared and prosecuted large numbers of applications for letters patent. Since 1878 I have been frequently called upon each year to give expert testimony in suits involving the infringement of letters patent, and devote a great deal of my time to this branch of my profession. In my general business I am constantly called upon to make com-
76 parisons between structures and patented devices and to express opinions with regard to identity or equivalency of the structure and the possibility of infringement. I have also in the course of my scientific work, had occasion to make a great many inventions of my own, and have obtained upon these about three hundred letters patent.

Q. 3. Have you examined copies of each of the following letters patent which have been referred to in this case, to wit: 527,242, dated October 9, 1894 (Complainants' patent in suit); 381,230, dated April 17, 1888; 475,700, dated May 24, 1892; 320,242, dated June 16, 1885; 297,382, dated April 22, 1884; British provisional specification 2125, of 1862, dated July 26, 1862, and British patent 11,332, of 1885, dated September 23, 1885, and if so, do you understand the devices, machines and processes described therein?

A. I have examined the various letters patent referred to in question and fully understand the structures and processes or methods therein set out.

Q. 4. Please explain the improvement which you find described and claimed in letters patent No. 527,242, Complainants' patent in suit, and compare the same with the processes disclosed in Goldings' U. S. Patent 207,382, in Long's British provisional specification No. 2125 of 1862 and in Johnson's British patent No. 11,332 of 1885?

A. The Golding patent 527,242 in suit relates to a method of making expanded sheet metal, in which the expanded metal shall have a length substantially equal to the length of the blank from which it is made, and the structure is to be formed "by simultaneously cutting and opening or expanding the metal at the cuts by stretching the severed portions." This method is stated in the claim as follows:

"Slitting and bending portions of a plate or sheet of metal in such manner as to stretch or elongate the bars connecting the slit
portions and body of the sheet or plate, and then similarly
77 slitting and bending in places alternate to the first mentioned
portions, thus producing the finished expanded sheet metal
of the same length as that of the original sheet or plate."

While this claim supplements the statement of the method by a statement that the finished expanded sheet metal will be of the same length as that of the original plate I understand this to mean "substantially" of the same length, the object being to prevent a material decrease in length.

The method claimed in the patent 527,242 in suit differs from the Golding patent 297,382 in that this latter patent comprehends the making of expanded sheet metal without stretching the bars and with great reduction in length of the sheet of the expanded metal so that it is greatly less than the length of the sheet or blank from which it was made. In this patent the plate is slashed or cut, the successive rows or cuts breaking joint. The sheet so prepared is then extended or stretched as a whole transversely to its length which causes the bars to bend as shown in Fig. 2, but without any stretching or extension of the length of those bars. The length is greatly reduced from the length of the original plate or sheet. It differs from the patent in suit in the two particulars, namely: Its bars are not stretched or extended and its length is greatly reduced. This patent 297,382, therefore, does not disclose the method described and claimed in the complainants' patent 527,242 in suit.

British provisional specification No. 2125 of 1862 describes a structure of expanded sheet metal and a method of making it similar to that of the Golding patent 297,382, and differs from the method claimed in the complainants' patent 527,242 in suit in the

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same particulars, namely, it does not disclose the idea of stretching or lengthening the connecting bars and greatly reduces the length of the expanded sheet compared with the length of the sheet of the blank from which it is made.

British patent No. 11,332, of 1885, discloses substantially
78 the same structure and method of making, the same as
found in the Golding patent No. 297,382 and British provisional specification No. 2125 of 1862. This patent describes that the slits may be in the form of slots and it further discloses a blank for making baskets or cylindrical articles, Fig. 3. In describing the process the patentee states:

"The plate is then pulled in a direction or directions transversely to the length of the slits or slots and over a suitable former or mould if desired * * *"

Figs. 1 and 2 show the character of the blank and the expanded sheet metal respectively. As to the direction of pulling or stretching the patentee says:

"The sheet *a* thus slitted or slotted is then pulled or stretched in the direction of the arrows *d, d* that is to say transversely to the direction of the slits."

From this I understand that the sheet is simply pulled in the direction of the plane of the sheet so as to pull it into the form shown in Fig. 2. This does not stretch or elongate any of the connecting bars as required in the case of the method of the patent in suit. The lengthening quoted precludes any understanding which would imply stretching or elongating the bars or even pulling them in a plane transversely to the plane of the blank as is required in the patent in suit. This British patent also says:

"This pulling or stretching or opening out of the slits or slots may be effected by means of any suitable stretching apparatus such for example as a combination of pairs of blocks between which the opposite sides of the plate are held the blocks being forced apart by screw or other power."

This paragraph clearly shows that "pulling or stretching" as used by the patentee means "opening out of the slits" and this in no sense implies stretching or elongating the bars formed by the slits. This is confirmed by the description of the apparatus proposed for
stretching or opening out the slits as said apparatus could
79 not produce the sheet shown in Fig. 2 and elongate or stretch
the bars.

The patent also says with regard to the basket structure:

"This may be effected in any convenient manner such as by stretching the sheet out over a form or model of the required shape by means of suitably arranged stretching mechanism as hereinbefore mentioned."

This clause, as well as the first quoted clause, clearly indicates that the mould or former is simply a shape over which the sheet as a whole is shaped. In the case of a rectangular sheet as in Fig. 1 the former or mould might be simply a curved surface to give an arched form for the expanded sheet metal in completed form such as employed in concrete ceiling structures. There is absolutely nothing

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in this patent which comprehends stretching in the sense of elongating the bars and no apparatus is described or referred to which could perform such a result.

I notice that the length of the sheet in Fig. 2 is approximately the same as the length of the sheet in Fig. 1, but this is immaterial and simply a draughtsman's license these figures being simply illustrative and not intended to be "working drawings" or made to scale. It would be utterly impossible for the expanded metal sheet, Fig. 2, to remain equal in length to the blank before being stretched, and shown in Fig. 1, from performing any of the operations described in the patent. In every case the length of the expanded sheet metal is greatly less than the length of the blank before being stretched, and in this respect differs from the method called for by complainants' patent 527,242 in suit.

Q. 5. Please compare the process described in patent 320,242 and carried out by the machine described in patent 381,230 with the process of complainants' patent in suit?

A. I have made the comparison called for in the question and am of the opinion that the method of making open or reticulated metal work claimed in complainants' patent 527,242 in suit is not disclosed in either of the patents 320,242 or 381,230 specified in the question. My reasons for this opinion are, that the two essential features of the method of patent 527,242, namely, the stretching of the bars forming the sides of the reticulated structures and the maintaining of the length of the completed expanded sheet metal substantially equal to that of the blank from which it is made, are not found in the patents 320,242 and 381,230. In these patents, the forming of the openwork is done in a diagonal manner and so that the machine makes successively each of the open structures constituting a series or row, *a, c, h;* and this method is employed for the specific purpose of preventing any stretching or elongation of the connecting bars and positively contracting or materially reducing the length of the expanded metal relatively to the length of the blank from which it is made. Because it is essential to the method set out in patent 320,242 that the feature essential to the method of complainant's patent 527,242 shall be omitted, it of necessity follows that the method of the complainant's patent is not disclosed in Letters Patent 320,242 and 381,230.

Q. 6. Please compare the process carried out by the machine described in Letters Patent No. 475,700 with the process of complainants' patent in suit?

A. I have compared the process as carried out by the machine of patent 475,700 with the method specified and claimed in complainants' patent 527,242 and find the two methods entirely different and adapted to produce very different kinds of metal structures. Patent 475,700 is for a machine for making metal lathing which consists of a sheet S from which are stamped laterally extending looped portions S^1, those of each row being staggered relatively to those of the other adjacent rows. These loops S^1 are stretched so as to form a series of projecting parts for receiving the plaster. Under no conditions has one of these loops S^1 any correlation to the others, and no stretching

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or other manipulation can produce a reticulated sheet consti-
81 tuting expanded metal of the nature disclosed in complain-
ants' patent. To make any semblance of similarity between the sheet disclosed in patent 475,700 and that of complainants' patent in suit, we would have to remove the looped portions S¹ and then expand the body A which remains. As such would be inconsistent with what is described, it is evident that the method claimed in the patent in suit is not disclosed in patent 475,700. It is also evident that as the sheet S is not stretched or distorted, the total area does not change and consequently we could not have expanded sheet metal nor the method of the patent in suit. This patent 475,700 shows nothing which would produce expanded sheet metal or which would employ the method of the complainants' patent 527,242 in suit; and in my opinion, it is irrelevant. It shows nothing more than that loops were forced from the body of the sheet and were stretched, but without any co-operation between the loops. In fact, to make any similarity to the method of the patent in suit, it would be necessary to remove the loops S¹ and then stretch the connecting portions of the sheet S, but as this is wholly at variance with the disclosure and object of the patentee, it is inadmissible. This patent 475,700 in my opinion has no bearing whatever upon the method claimed in the patent in suit.

Direct examination closed.
Adjourned to Tuesday, September 13, 1904, at 2 P. M.

TUESDAY, *September* 13, 1904, at 2 p. m.

Met pursuant to adjournment.
Present as before.

Cross-examination of the witness, Mr. R. M. HUNTER.

By Mr. FAIRBANKS:

X Q. 7. You have made reference in your direct deposition to the mechanical steps recited in the claim of the patent in suit, please tell me if you have ever seen such steps actually performed, and if so, when and where?

82 A. I have never seen the manufacture of the expanded sheet metal described in the patent in the process of being produced, but the said process is so very simple that a clear understanding of it is easily had from the specification and illustration of the patent in suit.

X Q. 8. Please tell me if you have ever seen a machine of the defendants' Bradford patent 664,379, granted Dec. 25, 1900, in actual use? If so, tell me when and where?

A. No; I have not seen the machine referred to in the question, and have not seen the making of expanded metal upon such a machine.

X Q. 9. Of your own personal knowledge, you know nothing as to whether or not the defendants' machine just referred to produces

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an expanded metal sheet of greater or less length than the blank, isn't that so?

A. I have never seen the machine of patent 664,379 in operation, and, therefore, if the question means by the language of "my own knowledge," the actual observation of the making of expanded metal on such machine, I can simply say that I have no knowledge from such an observation as to whether the said machine produces an expanded metal sheet of greater or less length than the blank, but as an engineer familiar with the construction and operation of machinery, I feel that I can express an opinion in the most positive manner that the defendants' machine in question would make an expanded metal which would not have materially less length than the blank and would have possibly a very slight increase because of the peculiar manner in which it is made, there being a very slight tendency to extend the length rather than reduce it. In other words, the blank should be practically or substantially the same in length as the expanded metal.

X Q. 10. The functional limitation which concludes the recital of the mechanical steps of the claim of the patent in suit, is to the effect that the finished expanded sheet metal is of the same length as that of the original sheet or plate. If the finished expanded
83 sheet was an inch longer than the blank, do you think that would be within the scope of the claim?

Objected to as indefinite, in that the length of the original blank is not given, therefore the elongation of an inch is meaningless.

A. It is my opinion that in a blank of considerable length, such as employed in the making of large sheets of expended metal, the extension of the length of one inch in the expanded metal the length of the blank would not in any sense preclude the process of making such expanded metal being included under the claim of the complainants' patent in suit. As I understand the invention of the patent in suit, the object is to provide a process or method which shall prevent materially shortening the length of the expanded metal relatively to the length of the blank, and there is nothing in the patent which would imply that lengthening it would be undesirable or contrary to the method of process. The substance of the claim merely means that the process be such that the expanded metal is at least of substantially the same length as that of the original sheet or plate, that is to say not of a materially less length. So long as the process is carried out in the making of the expanded metal it would be, in my opinion, wholly immaterial if there was a slight increase in the length of the expanded metal over the length of the plate or blank. Such increase in length may exist without in the least affecting the real method or process defined in the claim.

X Q. 11. So that you interpret the functional limitation which concludes the recital of the mechanical steps of the claim of the patent in suit, to wit: "thus producing the finished expanded sheet metal of the same length as that of the original sheet," not to mean what the claim of the patent says, but to mean substantially of the same

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length within variations of an inch or so, as explained in your last answer, is that so?

A. Your question hardly states correctly the meaning of
84 my last answer. To make myself perfectly clear on this subject, I will say that the functional statement at the end of the claim is in my opinion only to be read as an illustration of the object of the method which is recited in the first part of the claim, but is not taken as preventing the claim from including structures which are full equivalents of such functional statement. The object of the patent is to prevent material reduction in the length in the expanded metal over the length of the blank from which it was made, and it is absolutely silent with regard to the increase in the length of the expanded metal over the length of the blank, the patentee assuming no doubt that no very great increase would be made in commercial manufacture, and, even if it was made, it would not introduce an objectionable feature, such as the material reduction in the length of the expanded metal relatively to the length of the blank. In view of this condition it is my opinion that the carrying out of a method, which produces expanded metal in the manner recited in the first part of the claim, would be included under the claim, if the said methods did not produce a materially shortening of the length of the expanded metal relatively to the blank, and would also be included if the length of the expanded metal was somewhat increased, even to the extent of an inch in a reasonably long plate, over the length of the plate or blank.

X Q. 12. The sum and substance of your last answer is practically that the functional recital in the last four lines of the claim of the patent in suit is to a certain extent immaterial, by this I mean the alleged method of the claim is really the two mechanical steps recited in the claim, isn't that so?

A. That is so, because the words "substantially as described" would refer back to the specification, which would clearly show that the method claimed was such a method as would produce a degree of stretching or elongation of the bars as would at least prevent
85 material reduction in the length of the expanded metal relatively to the length of the blank or plate from which it was made.

X Q. 13. So that it is true, in view of your last answer, that the words "substantially as described" which conclude the claim of the patent in suit have the effect to throw us back to the specification of the patent in suit in reaching the proper understanding of the mechanical steps recited in said claim, is that not true?

A. That is true.

X Q. 14. You have made reference to Golding's U. S. Patent 297,382, please tell me whether or not you have ever seen the machine of this patent in operation, and if so, when and where?

A. I have not seen the machine for making the metal screening described in the patent referred to.

X Q. 15. In your direct deposition you have also referred to Long's British provisional specification No. 2125 of 1862, please tell

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me if you have ever seen the machine for making the expanded metal described in Mr. Long's patent in operation, or have you ever seen the product described in this same patent, if so, tell me when and where?

A. No, sir; I have seen neither the machine nor the product.

X Q. 16. You have also made reference to Johnson's British patent No. 11,332, of 1885, please tell me whether or not you have ever seen the apparatus or the product described in this patent, and if so, please say when and where?

A. I have not.

X Q. 17. In the patent last referred to, Mr. Johnson states in lines 18 to 20 of the specification as follows:

> "Fig. 1 represents a metal sheet having longitudinal parallel slits formed therein ready to be stretched or pulled and opened out, and Fig. 2 represents the same sheet after it has been stretched or pulled and opened out."

86 I understand from your direct deposition that you deny that Figure 2 represents the slitted blank after being stretched even though the patentee asserts that it does?

A. Your understanding is incorrect. The illustrations of Figures 1 and 2 are simply pictures to give an idea of what the blank looks like after being slitted or slotted, and what it looks like after being stretched to constitute expanded metal. They are not intended to be accurate or working drawings. I have made thousands of drawings for patents and know that it is not customary for mechanical draughtsmen to make illustrations of this character to a scale. However, I would point out the scale of the drawing Fig. 2 is slightly larger than the scale of the drawing of Fig. 1, so that notwithstanding that the sheet actually intended to be represented was reduced in length in the expanded metal over the blank from which it was made, the picture effect of Fig. 2 might readily have the same length as the picture effect of Fig. 1 which is made on a slightly smaller scale. This would actually be the condition if these two Figures were made as working drawings, so that I feel absolutely positive in the opinion which I have expressed relatively to the structure of this patent, namely notwithstanding the fact that Figs. 1 and 2 are of substantially the same length to the eye, the expanded metal illustrated in Fig. 2 is naturally shorter than the length of the blank shown in Fig. 1, and that this would be clearly seen if the scale of Fig. 2 was reduced to the scale of Fig. 1.

X Q. 18. You have already stated that you have never seen the machine of Mr. Johnson's British patent, and that you have not seen the finished product referred to in the same patent, now please tell me whether or not, you have ever at any time, yourself personally, actually taken a sheet of metal slitted it as described by Mr. Johnson and then stretched it, if so, please tell me when and where you did this?

87 A. I have had no occasion to slit a sheet and stretch it, and I do not have to perform that operation to enable me to testify

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positively as to what must take place in carrying out the operation or method specified in the Johnson patent.

X Q. 19. In view of your previous answer that you have never seen expanded metal of the character under mention, that you have particularly never seen the mechanism or the steps of the product, particularly of Mr. Johnson's British patent, isn't is true that in what you have stated you have been simply guessing and theorizing about this thing, isn't that the plain English of it?

A. No, that is not correct. My knowledge of machinery and mechanical structures enables me to state very positively what is the construction intended to be described and illustrated in the Johnson patent, and I do not believe that it is possible for me to make an error in my understanding of that patent. The matter is so clear and so simple that ordinary intelligence alone is necessary to understand what the structure produced must be. I am positive that my statements are correct, and that they are in no sense based upon guesses.

X Q. 20. Have you ever seen a machine of the U. S. patent to Ohl, 475,700, dated May 24, 1892, in actual operation anywhere? If so, please tell me when and where.

A. No, I have not.

X Q. 21. Please look at Fig. 11 of the patent just referred to, and state if it is not a fact that the part lettered S^1 is a bar connecting slit portions of the body and is not said bar or bars slightly stretched and elongated during this action of slitting, and is it not so described and shown by Mr. Ohl?

A. The statement is correct, excepting in one particular, where it speaks of portions of the body, for as I view the matter it is simply a loop forced down from the body and does not connect portions of
the body in any sense corresponding to the structure involved
88 in expanded metal. The mere use of language describing
this structure which might sound familiar to that used in describing expanded metal does not make the structures similar, nor does it make the process similar. Without regard to the language employed, it is my opinion that the Ohl structure and the method of producing it have absolutely no relevancy whatever to what is known as expanded metal or to the process or method specified in the claims of the complainants' patent in suit.

X Q. 22. So that is your belief, is it, that Mr. Ohl does not show or describe the steps of slitting or bending portions of a sheet of metal in such a manner as to stretch or elongate the bars connecting the slit portions, is that so?

A. I did not say so. Taking your words as applying solely to the Ohl structure, they are correct; but that does not imply in any manner that the structure of the Ohl patent has any relevancy or bearing upon the structure disclosed in the complainant's patent, or to the method recited in the claim thereof. The slitting is entirely different and the successive steps operate upon the sheet metal in an entirely different manner and could not under any method of operation produce the structure disclosed in the complainants' patent in suit.

X Q. 23. In your previous answers I understand that you have said that you personally have never made any of the expanded metal of the character under consideration or the kind described in any of the prior art patents, you have never seen such expanded metal in the actual process of manufacture and you have never seen any of the processes or apparatus described in any of the prior art patents, and you have never seen the process of the patent in suit carried out, and you have never seen a machine of the defendants in actual operation; that is a correct statement, is it not?

A. That statement is correct. I have, however, seen a great deal of the expanded metal manufactured and used, and I have also had occasion to slit and expand models of cardboard and paper 89 in considering expanded metal structures. I do not believe that anything that I have stated would be changed or modified in the smallest degree by the most thorough and full examination of any and all of the structures or machines or observation of the process of manufacture specified in your question. Such examination and observation are not at all necessary to arrive at a clear and comprehensive understanding of the matters here involved.

Cross-examination closed.

JOHN F. GOLDING recalled for further examination.

By Mr. HUNTER:

Q. 123. At the close of your cross-examination on Friday, you were asked by defendants' counsel to produce a full-sized blank and also an expanded sheet, from a blank of the same size, which had been made from such blank in accordance with the process of the patent in suit and under a machine of the character described in your patent 581,713. Are you now able to produce such blank and sheet of expanded metal made from a similar blank?

A. The sheet of expanded metal having a narrow strip remaining on it is such as are produced upon the machines which carry out the process of the patent in issue. The uncut strip is a necessary scrap, as in practice we cannot cause the machine to consume it all for the reason that we cannot continue the hold upon it. This strip, however, is sometimes considerably less than the strip shown in the specimen. It will be readily seen that the width of the intersections of the expanded part, of which there are thirteen, if added together plus the width of the remaining strip, will be equal to the blank sheet here offered in evidence. That is to say three inches and a half of blank metal make the expanded portion, leaving one and a half inches of the unexpanded portion equals the five inches of the blank exhibited.

90 Q. 124. What is the length of the blank and sheet of expanded metal to which you have just referred?

A. The length of the blank sheet of metal is eight feet; the same as the length of the strip left on it, with the exception of the slight contraction of the last meshes, that is the end meshes of the sheet which are slightly deformed as previously stated.

Q. 125. Will you also produce a partially formed sheet of expanded metal full size made according to the process of your patent 320,242, and under a machine of the character described in patent 381,230?

A. The sheet of metal is offered in evidence, which is partly cut and partly expanded; such cutting and expanding being diagonally from the sheet represents as nearly as possible the length of uncut metal of 110 inches. The length of expanded metal produced from the 110 inches is shown by measuring the finished line of expanded metal on said sheet, that is the line furthest away from the uncut sheet, and this length as will be seen is about 88 inches or a difference of about 22 inches between the finished article and the blank.

Q. 126. Where did you obtain these two full sized sheets of expanded metal and full sized blank you have just produced?

A. Upon your request and at the request of counsel for the defense, I telegraphed to Messrs. Chess Bros., of Pittsburg, Pennsylvania, to forward specimens such as I have referred to and as shown here.

Q. 127. From your knowledge of the product of the factory of Chess Bros., please state how the full sized sheets which you have here produced compare in size, form and all other details with the regular commercial product manufactured and sold by them?

A. I know these to be the same as are made and sold by Messrs. Chess Bros., as they are exactly similar in manufacture to the large quantities of metal that I have been accustomed to seeing, 91 handling and measuring, and having also made the same article myself with the machines under both processes as here illustrated.

Complainants' counsel now offers in evidence the blank sheet produced by the witness, and the same is marked, Complainants' Exhibit No. 16, Full Sized 8-foot Blank, also the sheet of expanded metal made under the new process from a blank of the same size as Exhibit 16 and the same is marked Complainants' Exhibit No. 17, Sample H; Full Sized Sheet Process of Patent in Suit; also the partially made sheet of expanded metal made under the old process, and the same is marked, Complainants' Exhibit No. 18, Sample I; Full Sized Partially Made Sheet Old Process.

End of direct examination.

Cross-examination.

By Mr. FAIRBANKS:

X Q. 128. Where were you when the various specimens just offered in evidence were made, and did you personally see the same manufactured?

A. I did not personally see the specimens manufactured. As I did not see them manufactured, I cannot state at what particular time they were manufactured and would have considerable difficulty in telling, therefore, where I was when they were manufactured.

X Q. 129. Please give me the name of the operator who manufactured these specimens if you can?

A. Mr. Henry Chess, one of the Chess Bros., and one of the complainants in this suit is the Works manager of the Works at Rankin, and Mr. Moody is the assistant Manager at the same Works, where these goods were made. Either one of these two gentlemen would have the supervision of the making of these samples, and they were undoubtedly made in response to my telegram on Friday last requesting that such samples be sent here.

92 In view of the last two answers of the witness Mr. Fairbanks objects to the entire deposition of the witness beginning with Q. 123 up to and including Q. 127, both questions and answers inclusive, for the reason that the same is obviously incompetent and immaterial.

Defendants' counsel also objects to the offer of these specimens made under answer to Q. 127 for the reason that the witness has no personal knowledge of the same, and they are also obviously incompetent, irrelevant and immaterial.

Objection is further made to answer to X Q. 129 as the same is obviously hearsay incompetent, irrelevant and immaterial.

Cross-examination closed.

It is stipulated, admitted and agreed by counsel for the purposes of evidence in this case that the complainant, The Expanded Metal Company, is incorporated and transacting business under the laws of the State of Missouri, and that Henry Chess, Walter Chess, and Harvey B. Chess, of Pittsburg, Pennsylvania, trading as Chess Bros., were, at the time of the filing of the Bill of Complaint herein, and are now, the sole and exclusive licensees under the patent in suit, No. 527,242, dated October 9, 1894, for the States of New York, Pennsylvania, New Jersey, Delaware, West Virginia and Ohio.

Signatures waived by agreement.

Complainant rests.

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(No Model.)

J. F. GOLDING.

METHOD OF MAKING EXPANDED SHEET METAL.

No. 527,242. Patented Oct. 9, 1894.

FIG. 1.

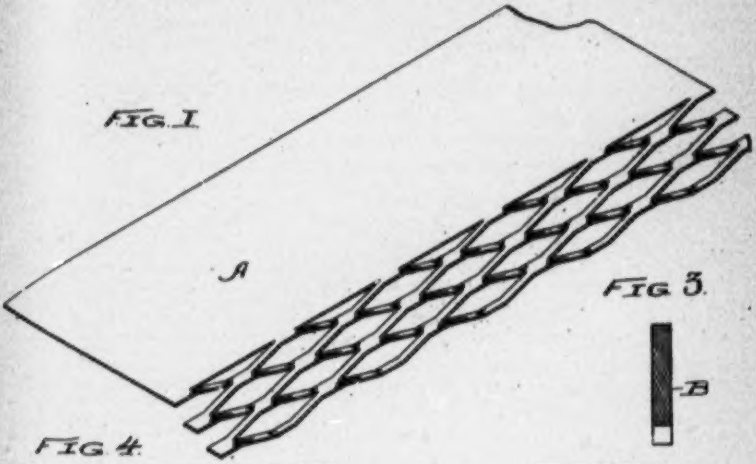


FIG. 3.

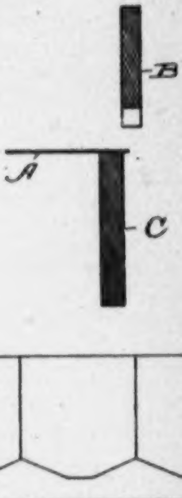


FIG. 4.

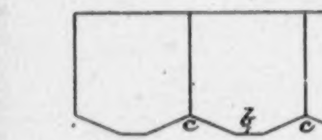
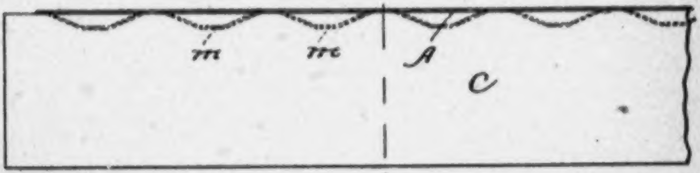


FIG. 2.



WITNESSES:
Lew. E. Curtis
H. M. Munday,

INVENTOR:
JOHN F. GOLDING.
BY Munday, Evarts & Adcock,
HIS ATTORNEYS.

UNITED STATES PATENT OFFICE.

JOHN F. GOLDING, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE EXPANDED METAL COMPANY, OF MISSOURI.

METHOD OF MAKING EXPANDED SHEET METAL.

SPECIFICATION forming part of Letters Patent No. 527,242, dated October 9, 1894.

Application filed May 7, 1894. Serial No. 510,343. (No specimens.)

To all whom it may concern:

Be it known that I, JOHN F. GOLDING, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in the Art of Expanding Sheet Metal, of which the following is a specification.

In the manufacture of what is now generally known as expanded sheet metal, it has been customary to first cut the slits in the sheet metal at short distances apart, and to open the metal at the cuts thus formed by bending the severed portions or strands in a direction at right angles substantially to the plane of the sheet. It has also been made by simultaneously cutting and opening the metal by means of cutters set off or stepped relatively so as to make the slashes or cuts in different lines in the manner set forth in Patents No. 381,230 or No. 381,231, of April 17, 1888. In both of these methods the product is somewhat shorter and materially wider than the original sheet, but practically no stretching or elongation of the metal forming the strands is caused.

In my present invention I seek to avail myself of the ability of the metal to stretch or distend as well as of its ability to bend under strain or pressure, and the invention consists in the improved method of making expanded metal, viz., by simultaneously cutting and opening or expanding the metal at the cuts by stretching the severed portions.

In the practice of the invention I prefer to make a series of slits in a straight line across the edge of the sheet, and at the time of cutting the slits and as a continuation of that operation to depress or stretch the severed metal, *i. e.*, those portions of the sheet lying outside of the cuts, in a direction at right angles to the sheet, without any contraction from the length of the original sheet. This operation is then repeated after the sheet has been fed forward, the slits being made opposite the portions unsevered at the previous operation, and so on until the entire sheet is expanded.

My invention allows the use of a single straight under knife, which of course does not need to be shifted in changing the location of the cuts, and the upper cutters are also arranged in a straight line, but their acting edges represent a corrugated form of alternate transverse projections and recesses adapted to coact with the under knife in cutting the slits at the proper intervals and to stretch the severed strands, and either the upper cutter or the sheet is shifted back and forth between the operations as will be understood.

In the accompanying drawings Figure 1 is a perspective of a sheet, a part of which has been expanded by my invention. Fig. 2 is an elevation of the preferred form of cutters used in manufacturing it. Fig. 3 is a section on line 3—3 of Fig. 2. Fig. 4 is a plan of the sheet showing the first line of slits in dotted lines.

In the drawings A represents the sheet from which the expanded metal is formed.

B represents the series of upper or moving cutters and C is the lower knife which may be and preferably is stationary. The lower edges of the cutters B are so shaped as to form alternate transverse projections *b* and recesses or intervening openings *c*, the projecting portions being adapted to coact with the lower knife in forming the slits. They are also adapted to force or carry downward the severed portions of the metal at the same operation to the position indicated by the broken lines *m* at Fig. 2. It will be noticed that at the time the bend is imparted to the severed portion, there can be no contraction in the product from the length of the sheet A because the ends of the severed portion or strand are still integral with the sheet and will not permit it. The sheet is then fed forward and the slitting and stretching operation is repeated. One line of slits across the sheet is formed at each operation, and the upper cutters, or the sheet, may be shifted and the sheet be fed forward between the operations so that the slits are in every case made back of the portions left unsevered at the preceding operation, or in other words the slits and unsevered portions alternate in position at successive operations. The bend given to the severed portion, or strands as they are usually called, is in a direction at

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right angles to the plane of the sheet, and as there is no contraction in the length of the metal, it necessarily follows that the expansion is obtained from the stretch, distension or elongation of the severed strands.

I claim—

The herein described method of making open or reticulated metal work, which consists in simultaneously slitting and bending portions of a plate or sheet of metal in such manner as to stretch or elongate the bars connecting the slit portions and body of the sheet or plate, and then similarly slitting and bending in places alternate to the first mentioned portions, thus producing the finished expanded sheet metal of the same length as that of the original sheet or plate, substantially as described.

JOHN F. GOLDING.

Witnesses:
L. E. Curtis,
Edw. S. Evarts.

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98

(No Model.)

J. F. GOLDING.

SLASHED METALLIC SCREENING.

No. 297,382. Patented Apr. 22, 1884.

FIG. 1.

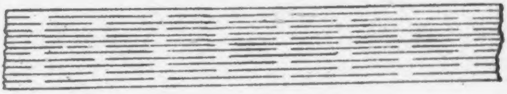
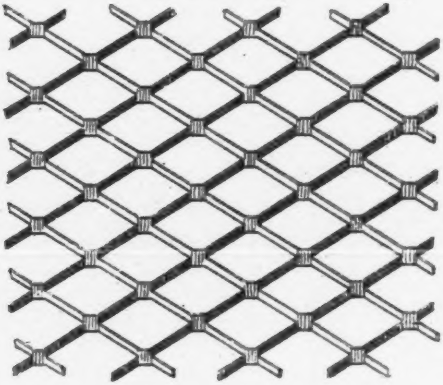


FIG. 2.



WITNESSES:
Henry Lawrence.
J. P. McElhany

INVENTOR
J. F. Golding
BY J. A. Cowles
ATTORNEY

UNITED STATES PATENT OFFICE.

JOHN F. GOLDING, OF CHICAGO, ILLINOIS.

SLASHED METALLIC SCREENING.

SPECIFICATION forming part of Letters Patent No. 297,382, dated April 22, 1884.

Application filed September 24, 1883. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. GOLDING, a citizen of the United States, residing at the city of Chicago, in the State of Illinois, have invented a new and useful Slashed Metallic Screening, of which the following is the specification.

Figure 1 is a view of the sheet metal slashed or cut. Fig. 2 is a view of the same sheet stretched to form the meshes.

The object of this invention is to produce a slashed metallic screening, as will hereinafter be shown.

In the manufacture of my slashed metallic screening, I take a blank piece of sheet metal of the required size and thickness, and at intervals I slash or cut it, as shown in Fig. 1, the slashes or cuts in each line of cuts being opposite to the spaces between the slashes or cuts of the adjoining line or lines. These slashes or cuts are made of the required lengths to form the proper-sized meshes. After the metallic sheet is cut or slashed, as above described, it is stretched in a line transversely to the length of the slashes or cuts, thus forming meshes as shown in Fig. 2. The act of stretching causes the metal forming the boundaries of each mesh to take an oblique position, amounting nearly to a perpendicular line, thus presenting the cut edges of the metal to the surface of the screening. Between the ends of the slashes or cuts are spaces of metal uncut which hold the strands of meshes together. The size of the mesh depends upon the length of the slash or cut, the longer the cut the coarser the mesh, and the shorter the cut the finer the mesh.

Having now set forth one feasible way of producing my slashed metallic screening, I desire it to be understood that I do not restrict myself to the precise details hereinbefore described, for the same can be varied without essential alteration in the characteristics of the article itself, the relative arrangement or position and the form of the slits or slashes, for instance, can manifestly be varied so as to produce a wide range of patterns, ornamental or otherwise, depending upon the use to which the screening is to be put.

The process hereinbefore described of producing the article I reserve for a separate application for Letters Patent.

What I here claim as new and of my own invention is—

As an article of manufacture, metallic screening formed of slashed and stretched metal, substantially as hereinbefore set forth.

JOHN F. GOLDING.

Witnesses:
ALONZO M. GRIFFEN,
F. J. GRIFFEN.

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(No Model.)

J. F. GOLDING.

PROCESS OF MAKING METALLIC SCREENING MATERIAL.

No. 320,240. **Patented June 16, 1885.**

Fig. 1.

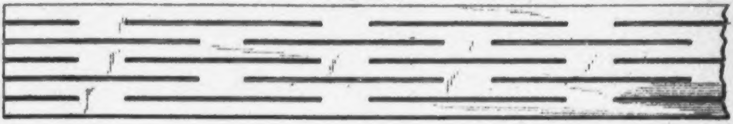

Fig. 2.

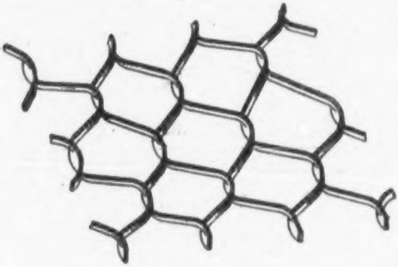

Fig. 3.

WITNESSES
F. L. Ourand
E. S. Fay.

INVENTOR
John F. Golding
By Jas. A. Cowles
Attorney

UNITED STATES PATENT OFFICE.

JOHN F. GOLDING, OF CHICAGO, ILLINOIS.

PROCESS OF MAKING METALLIC SCREENING MATERIAL.

SPECIFICATION forming part of Letters Patent No. 280,240, dated June 26, 1883.

Application filed December 13, 1882. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. GOLDING, a citizen of the United States, residing in the city of Chicago, in the State of Illinois, have invented a new and useful Process for Making Metallic Meshed or Screening Material, of which the following is a specification.

Figure 1 is a view of the material cut or slashed ready for forming the meshes. Fig. 2 is a view of the metal after the meshes are formed. Fig. 3 is an end view of Fig. 1, showing the slashed metal before the meshes are formed.

I take a piece of metal and make a series of rows of incisions throughout it, and between the ends of these incisions I leave uncut spaces, these incisions or cuts being so arranged that the uncut spaces will be at or about midway of the adjoining cuts, and thus the incisions or cuts and the uncut spaces are made to alternate throughout the sheet, the uncut spaces connecting the strands one with another, and the whole remaining in one piece, as is shown in Fig. 1. The metal thus prepared is opened at the slits by causing the cut edges to be passed by each other all in the same direction, and away from the original plane of the metal a sufficient distance to produce the desired size of mesh, the ends of each strand being bent in opposite directions at or near the uncut spaces sufficiently to set the metal and maintain the mesh, as is shown in Fig. 2. The metal is expanded so that the strands and uncut spaces have their greatest movement in the direction of or near a right angle to the original plane of the metal, and a less movement of the ends toward the center, the strands and uncut spaces having a base in the aggregate equal in width but shorter than the piece from which they are cut.

I claim—

1. In the art of making screening from slashed metallic plates or sheets, the improvement of bending the strands flatwise, line after line of strands successively, in forming the meshes, and setting the strands, substantially as before set forth, so that the strands will be disposed edgewise in the thickness of the finished screening.

2. The process herein shown for making slashed metallic screening, which consists as follows: making a series of rows of incisions or cuts throughout the metal, and between these incisions or cuts leaving uncut spaces, each uncut space being alongside of and between two incisions or cuts, and at or near the center of said cuts, the incisions or cuts of each row of incisions or cuts made to alternate with the uncut spaces throughout the entire piece of metal, opening the incisions or cuts in a manner to cause the cut edges to be passed by each other all in the same direction perpendicular to the original plane of the metal, thus bending each strand in opposite directions at points at or near the uncut spaces sufficiently to set the metal and maintain the mesh, the metal being so expanded that the several strands have their greatest extension in the direction of or near a right angle to the original plane of the metal, and a less movement of the ends toward the center, thus expanding the metal into a mesh.

JOHN F. GOLDING.

Witnesses:
P. P. AYER,
J. S. SALISBURY.

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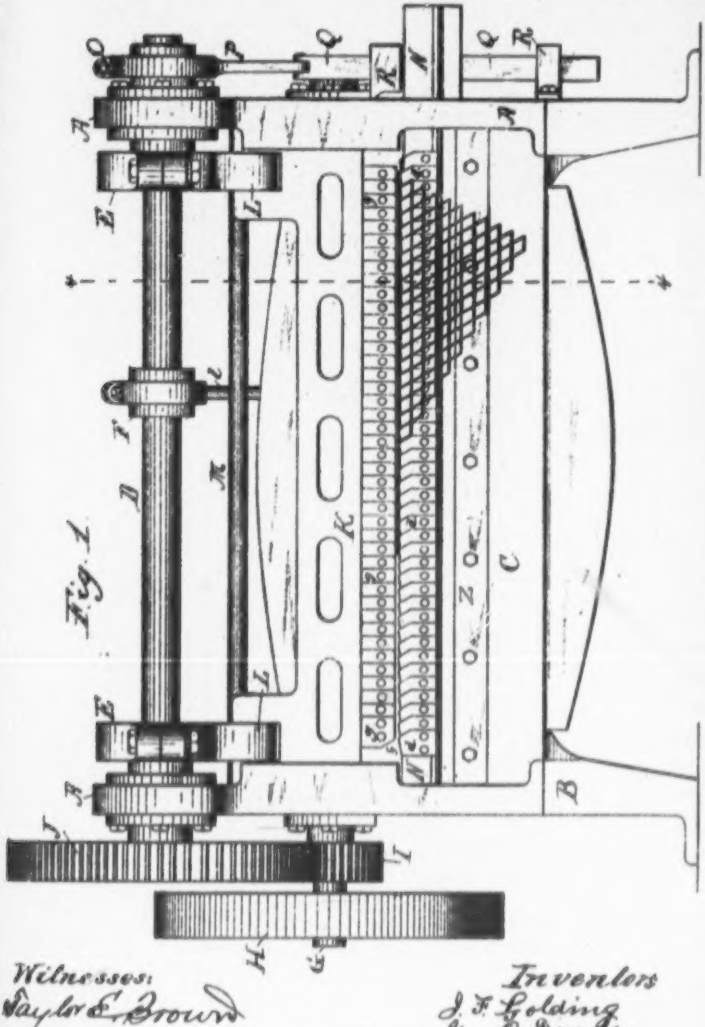
106

(No Model.) 5 Sheets—Sheet 1.

J. F. GOLDING & G. B. DURKEE.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

No. 320,241. Patented June 16, 1885.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G

Fig. 1.

Witnesses:
Taylor E. Brown
Lew. S. Curtis

Inventors
J. F. Golding
Geo B. Durkee
By Jas A Cowles
his Attorney.

69

108

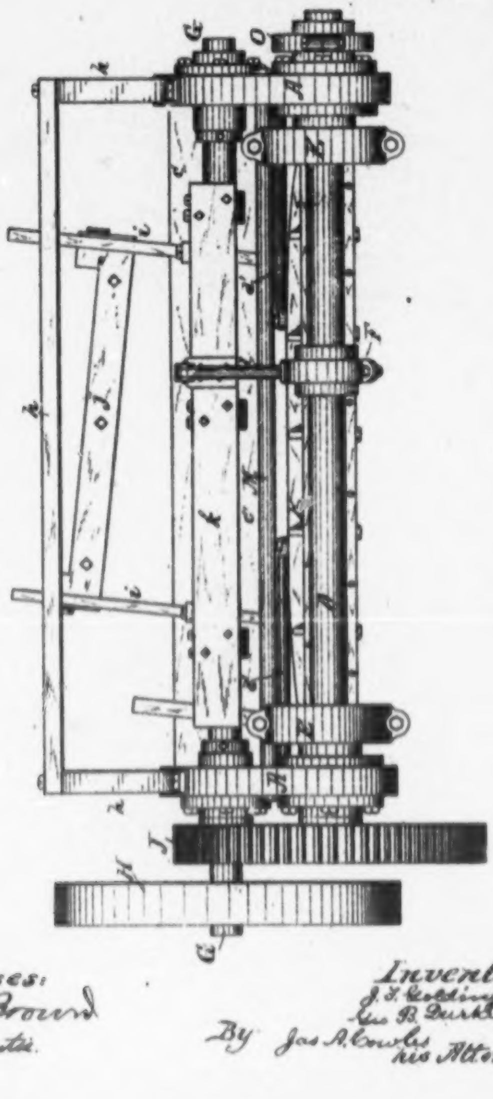
(No Model.) 5 Sheets—Sheet 2.

J. F. GOLDING & G. B. DURKEE.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

No. 320,241. Patented June 16, 1885.

Fig. 2.



Witnesses:
Saylor E. Brown
Geo. C. Curtis

Inventors
J. F. Golding
Geo. B. Durkee
By Jas. A. Cowles
his Attorney

(No Model.) 5 Sheets—Sheet 3.

J. F. GOLDING & G. B. DURKEE.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

No. 320,241. Patented June 16, 1885.

Fig. 4.

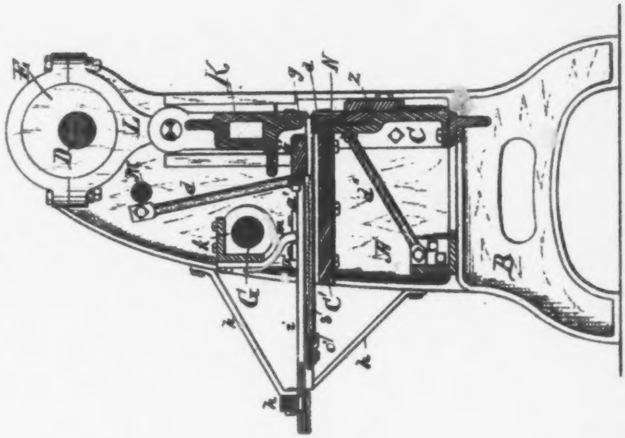

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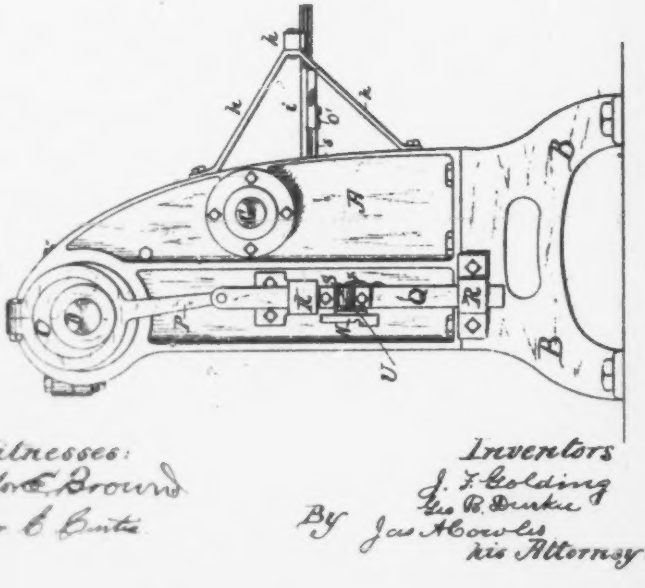
Fig. 3.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U

Witnesses:
Taylor E. Brown
Leo C. Curtis

Inventors
J. F. Golding
Geo. B. Durkee
By Jas. A. Cowles
his Attorney:

71
112

(No Model.) 5 Sheets—Sheet 4.

J. F. GOLDING & G. B. DURKEE.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

No. 320,241. Patented June 16, 1885.

Fig. 5.

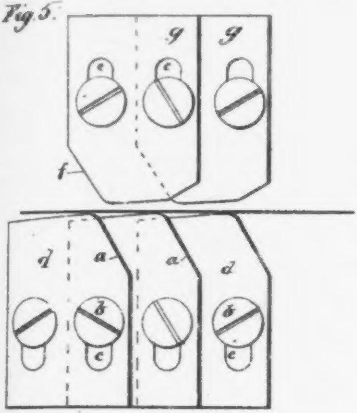
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Fig. 6.

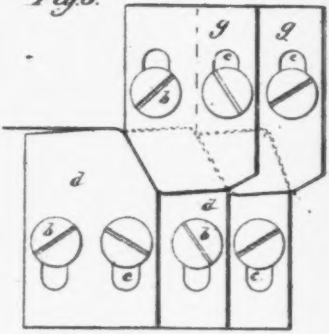
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Fig. 7.

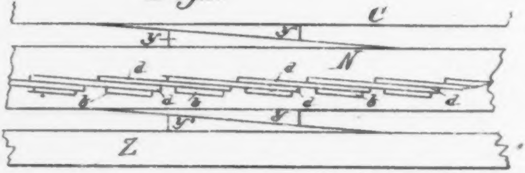
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Fig. 9.

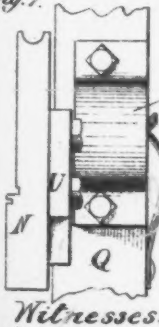
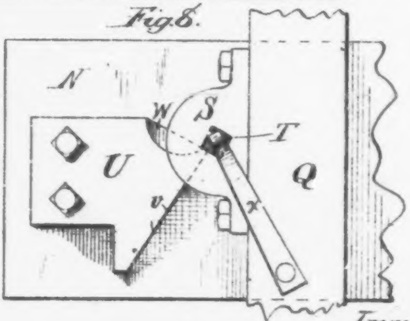


Fig. 8.



Witnesses:
Saylor E. Brown
Lew C. Curtis

Inventor:
J. F. Golding
Geo. B. Durkee
By Jas. A. Cowles,
his Attorney.

72
114

(No Model.)

5 Sheets—Sheet 5.

J. F. GOLDING & G. B. DURKEE.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

No. 320,241. Patented June 16, 1885.

Fig. 10.

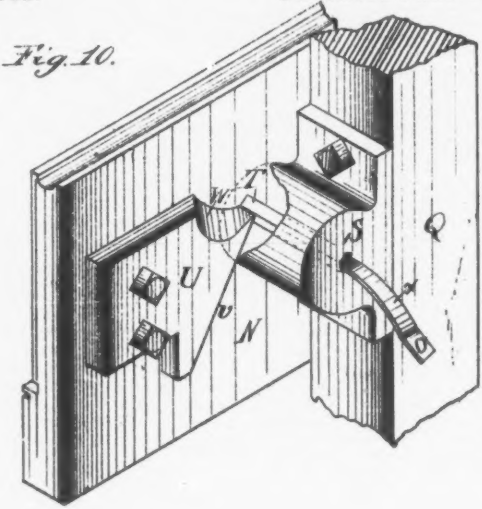


Fig. 11.

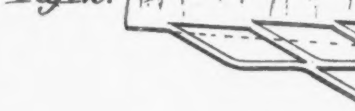
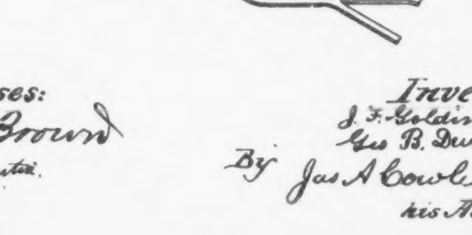


Fig. 12.



Witnesses:
Taylor E. Brown
Lew. C. Curtis

Inventors
J. F. Golding
Geo B. Durkee
By Jas A Cowles
his Attorney:

UNITED STATES PATENT OFFICE.

JOHN F. GOLDING AND GEORGE B. DURKEE, OF CHICAGO, ILLINOIS,
ASSIGNORS TO THE EXPANDED METAL COMPANY.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

SPECIFICATION forming part of Letters Patent No. 320,341, dated June 16, 1885.

Application filed August 22, 1884. (No model.)

To all whom it may concern:

Be it known that we, JOHN F. GOLDING and GEORGE B. DURKEE, citizens of the United States, residing in Chicago, in the State of Illinois, have invented certain new and useful Improvements in Machines for Simultaneously Cutting and Expanding Slashed Metallic Screening, of which the following is the specification.

Figure 1 is a front view or elevation. Fig. 2 is a plan view. Fig. 3 is an end view opposite to end where power is applied. Fig 4 is a vertical sectional view through line 4 4, Fig. 1. Fig. 5 is detail of cutters in position to receive the metal for cutting and expanding. Fig. 6 is detail of knives in position after having cut and expanded the metal. Fig. 7 is a top view of lower bar, showing position of lower series of cutters and the guides which cause the bar holding the lower cutters to move slightly obliquely to itself, but parallel with each lower cutter. Fig. 8 is a side view of one end of lower bar, showing cam for giving said bar longitudinal movement, and plunger which holds the dog that actuates the cam. Fig. 9 is an end view of end of lower bar shown in Fig. 8. Fig. 10 is a detail of cam movement to return lower bar to first position, as hereinafter will be explained. Fig. 11 is detail of ratchet and spring-catch for feeding sheet metal to cutters. Fig. 12 is a view of metal partially cut and formed and partially uncut.

The nature and object of this invention is to provide a machine for cutting and expanding slashed metallic screening, which was the subject of Patent No. 297,382, issued to John F. Golding, one of the applicants hereof.

A and B are the posts of the frame of the machine.

C is the front cross-beam, supported by the posts A and B.

D is the main shaft of machine, located at top and working in suitable bearings in the posts A and B. On this shaft are the eccentrics E E and eccentric F, the last being located near the center of shaft D.

G is the driving-shaft, suitably boxed in both end posts A B, and carrying drive-wheel H and spur-wheel I.

To the shaft E is attached a large cog-wheel, J, driven by spur-wheel I.

K is the upper bar, holding the upper series of cutters and actuated in a vertical plane by eccentrics E E and links L L.

M is a brace extending from one post to the other to strengthen the machine.

N is the lower bar, holding the lower cutters. This bar is provided with inclined offsets *y y*, and is movable between guides *y′ y′*, one of which is on front side of bar C, and the other is on back of bar Z. Bar Z is a cap extending along face of bar C, and provided with guides corresponding with the guides on front of bar N. The object of these guides is to give the bar N a slight oblique movement to cause the cutters attached to it to move parallel to the cutters on upper bar, K.

O is an eccentric on end of shaft D, and by pitman P connected to plunger Q, which works through guides R R.

On plunger Q, Fig. 10, is fastened the box S, in which works the dog T. This dog works against the cam U, which is attached to the lower bar, N, on its side near its end. This cam is cut beveled on the under side at V, and on the upper side it is formed with a scalloped bevel at W.

X is a spring fastened at its lower end to the plunger Q, the upper end resting against the outer end of dog T. This spring presses the dog against the cam U.

To the lower bar, N, is attached a series of cutters, *d*, by means of screws *b*, Figs. 5 and 6, where they are shown in detail. In each cutter is the slot *c*, through which the screw *b* works to admit of their being adjusted when worn. The form of these cutters is shown in the first one *d* of the series. The front edge is cut beveling, as shown at *a*. These cutters are placed one overlapping the other, as shown at *d d*, Fig. 7, and also in Figs. 1 and 2.

To the upper bar, K, Fig. 1, are fastened a series of cutters, *g g*, attached to this bar in a similar manner, each one overlapping the other in the same manner, and the rear lower part of each upper knife is cut beveling, as shown at *f f*, Figs. 1 and 5.

h h h, Fig. 2, is a frame attached to the posts A B, and extending backward in brace form, which is more clearly shown in Figs. 3 and 4.

i i, Figs. 2, 3, and 4, are two ratchet-bars, supported at their rear ends by the frame *h*, and secured to a bar, *b′*, at their front ends.

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The bar *b'* reaches from post A to B over the bed *c'* of the machine, just back of the cutters, and is supported at its center by braces *d' d'*, reaching from posts A B.

j, Fig. 2, is cross-bar extending from ratchet-bar *i* to *i*, and sliding beneath them. At each end of cross-bar *j* is a spring, *t'*, Fig. 11, one end being fastened to the cross-bar *j* and the other working against ratchet *i*, so placed that it allows the cross-bar *j* to freely move forward toward the cutters, but prevents it moving backward. By turning the cam *t''*, located above the spring *t'*, the free end of this spring is depressed, which allows the cross-bar *j* to be moved backward.

k, Figs. 2 and 4, is an angle-bar extending lengthwise of shaft G, and attached thereto by two or more collars extending around said shaft G freely working thereon, and connected to the main shaft D by the pitman *l*, working on eccentric F.

To collar *k*, Figs. 2 and 4, is attached dog *m*, and extending downward, the lower end working between heads *a' a'*. These heads are fastened to the ratchet-bars *i i*, and there are two of these dogs *m*.

d'' is a brace extending from posts A B to center and top of front of cross-bar C, to steady and support the machine.

The operation of our machine is as follows: Motion is communicated to the main driving-wheel H by belt or otherwise. As the eccentrics on E E revolve, the bar K is raised and lowered, which works the cutters *g g* fastened thereto up and down in vertical planes and over the cutters *d d* in lower bar, N. The position of the cutters before making their cutting movement is shown in Fig. 5—that is, they are separated, leaving a space between them. As the upper cutters descend in a vertical plane, the bevel edge of the upper cutters move along the surface of the bevel edge of the lower cutters, and the lower bar, N, to which the lower cutters are attached, being allowed to freely move longitudinally in its bearings, the descent of the upper cutters causes the lower cutters to move horizontally, and when the upper cutters have finished their downward movement the two sets of cutters are in the positions shown in Fig. 6. The downward and upward movement of upper cutters is caused by the eccentrics on shaft D. The return movement of lower shaft, N, with its cutters is accomplished as follows: As the downward movement of the cutters is made the plunger Q also descends, and at the same time the dog T, Fig. 10, takes its position on the lower bevel of cam U, and as the plunger rises the bar N is returned to its original position. A sheet of metal of the proper size is placed in position on bed C', with the rear edge resting against bar *j*, as shown at *s*, Fig. 4. The eccentric F on shaft D causes the collar *k* to rock, which in turn causes the lower end of dog *m* to vibrate. This causes the ratchets *i i* to move backward and forward, which in turn causes the cross-bar *j* to move forward and feed the metal to the cutters, and as the metal passes between the two sets of knives it comes out in strands cut and bent, (leaving uncut intervals,) which form and maintain a mesh, as more plainly shown in Fig. 12. In Fig. 1 it is shown in the act of issuing from between the knives.

It will be observed that there are intervals where the material is uncut, and that these uncut intervals form the union of the meshes. This uncut interval is formed as follows: The lower bar, N, is moved a certain distance. This distance is such that the upper corner of the beveled edge of the lower cutters is a little beyond the lower corner of the beveled-edged corner on upper cutters, and this distance between these two corners determines the uncut interval in the metal. The feeding movement is so adjusted that the metal is fed at each movement just far enough to form the strand, and as the upper cutters descend they push ahead of them that part of the metal, and at the same instant cut it from the main part of the metal, and this cut strand lies between the beveled edges of the two cutters and against the lower edges of the upper cutters. The entire piece of metal is consumed, and no part or portion is lost or wasted.

It will be observed that the metal is fed at an angle with the line of the cutters and parallel with the face of each cutter, and that the bar *j*, which forces the metal between the cutters, is set at an angle with the line of the cutters and parallel with the face of each cutter.

The reason why we feed the metal at an angle with the main cutting-bars of the machine is, first, that the said bars may be in line with the main shaft, and, second, that the metal may encounter the cutters first on one corner and in a line parallel with the surface of each cutter. The object in beginning to cut at one corner of the metal is that each cut, strand, or loop will be set free by a cut immediately back of it, said cut or cuts always supplying as much length of strand as the preceding knives consume, as the pressing the strands downward and forming the mesh causes the cut and spread part of the metal to assume a form shorter than the uncut part.

The improvement in the art of making screening from metallic plates or sheets incidental to the operation of this machine is claimed in our application for a United States Patent filed August 28, 1884, Serial No. 142,328.

We claim—

1. In a machine for cutting slashed metallic screening, the combination of the upper bar, K, provided with the cutters *g g* and having a vertical movement, with the lower bar, N, provided with cutters *a a* and having a longitudinal movement, as and for the purpose shown.

2. In a machine for cutting slashed metallic screening, the bar K, provided with cutters cutting over bar N, provided with similar knives, the first working vertically while the second is working horizontally, to provide the

necessary cutting-surface and space for the cut loops to expand.

3. In a machine for cutting slashed metallic screening, the cutters in each cutter-bar arranged one overlapping the other for the purpose of simultaneously cutting a number of slashes and forming loops, leaving uncut sections between them for the purpose of forming a continuous mesh from one piece of metal without cutting away or wasting any of the material, as and for the purpose shown.

4. The combination of the cutter-bar provided with cutters set at a slight angle with the surface of the bar with guides whose faces are parallel with the faces of the cutters, causing the cutters to travel in a line with their own faces and the bar to have a slight oblique movement, substantially as shown.

JOHN F. GOLDING.
GEORGE B. DURKEE.

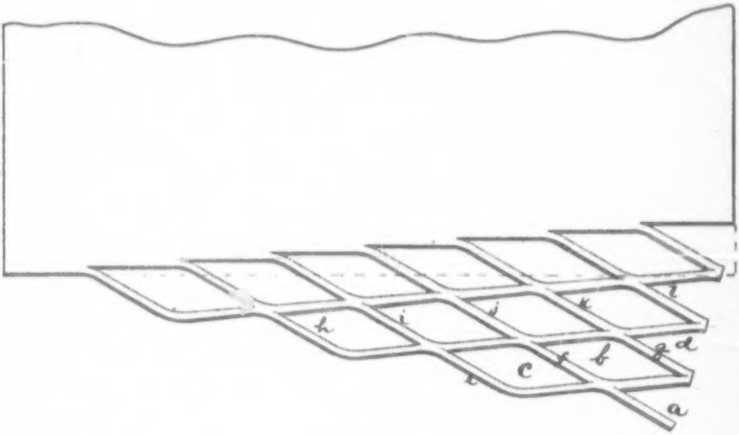
Witnesses:
JAS. A. COWLES,
J. P. MCELROY.

(No Model.)

J. F. GOLDING & G. B. DURKEE.

PROCESS OF MAKING SLASHED METALLIC SCREENING.

No. 320,242. Patented June 16, 1885.



Witnesses:
Taylor E. Brown
Lew E. Curtis

Inventor:
John F. Golding
Geo. B. Durkee
By Jas. A. Cowles.
his Attorney.

UNITED STATES PATENT OFFICE.

JOHN F. GOLDING AND GEORGE B. DURKEE, OF CHICAGO, ILLINOIS, ASSIGNORS TO THE EXPANDED METAL COMPANY.

PROCESS OF MAKING SLASHED METALLIC SCREENING.

SPECIFICATION forming part of Letters Patent No. 320,242, dated June 16, 1885.

Application filed September 5, 1884. (No model.)

To all whom it may concern:

Be it known that we, JOHN F. GOLDING and GEORGE B. DURKEE, citizens of the United States, residing in the city of Chicago, Illinois, have invented a new and useful Process for Manufacturing Slashed Metallic Screening, of which the following is a specification.

The nature and object of this invention is to provide a process whereby slashed metallic screening, as described in Patent No. 297,382, issued to John F. Golding, one of the applicants hereto, can be successfully manufactured.

The accompanying drawing shows a sheet of metal used in manufacturing slashed metallic screening, partially cut and partially uncut.

The process consists in the employment of a flat piece of metal of any desired size, and beginning at one side and corner and making an incision within the side of the metal, thus forming a strand which is simultaneously pressed away from the plane of the metal in a direction at or near a right angle, the position the stand assumes depending upon the distance it is moved from the plane of the metal. *a* in the drawing shows the first cut made. The next step in this process is to make additional incisions, as is shown at *c*, *b*, and *d*, further within the plate of metal, and leaving uncut sections at the ends of the cuts, and simultaneously with the cutting the strands are pressed away from the plane of the metal at the angle and to the desired position, as above described. Thus each row of meshes is simultaneously cut and formed from a blank piece of metal without buckling or crimping the blank. In the act of cutting and forming the meshes, the finished article is contracted in a line with the cuts or incisions, and consequently it is shorter in this direction than the piece from which it was cut, but is greatly lengthened in a line at an angle to the plane of the original sheet plate or blank.

The object of beginning to cut within one side and the corner is, that the cut furthest within the metal will produce a strand which as it is cut and bent downward or away from the plane of the uncut metal will allow the strands in advance of it to be freely cut and bent away from the plane of the metal simultaneously therewith. It is evident that the meshes could not be cut and simultaneously formed if the cuts were made in a single direct line across the metal, for the reason that as the meshes are made the article which they form is contracted to a length less than the original length of the metal from which it is cut.

By inspecting the drawing it will be observed that the line between the cut and uncut parts of the metal is in step form, thus forming an oblique line across the metal.

Our application for a United States Patent, filed August 28, 1884, Serial No. 141,621, describes a machine for practicing this invention.

We claim—

1. In the art of making metal screening by slashing metallic plates or sheets and then bending the strands flatwise line after line successively in forming the meshes and setting the strands, the improvement which consists of opening successive lines of meshes on lines parallel with one another, but oblique to the original edge of the sheet, substantially as before set forth.

2. The process herein shown and described of making slashed metallic screening, which consists in cutting successive slashes or incisions in the sheet, beginning at one side and near the corner thereof, and pressing the strips thus partially disconnected from the sheet successively away from the sheet in a direction oblique thereto, but otherwise in a plane perpendicular to said sheet, or substantially so, the two operations, as well as the further operation of bending the connected material and giving form and set to the meshes, being effected by the simultaneous operations of slashing and pressing.

JOHN F. GOLDING.
GEORGE B. DURKEE.

Witnesses:
JAS. A. COWLES,
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(No Model.) 7 Sheets—Sheet 1.

J. F. GOLDING.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

No. 381,231. Patented Apr. 17, 1888.

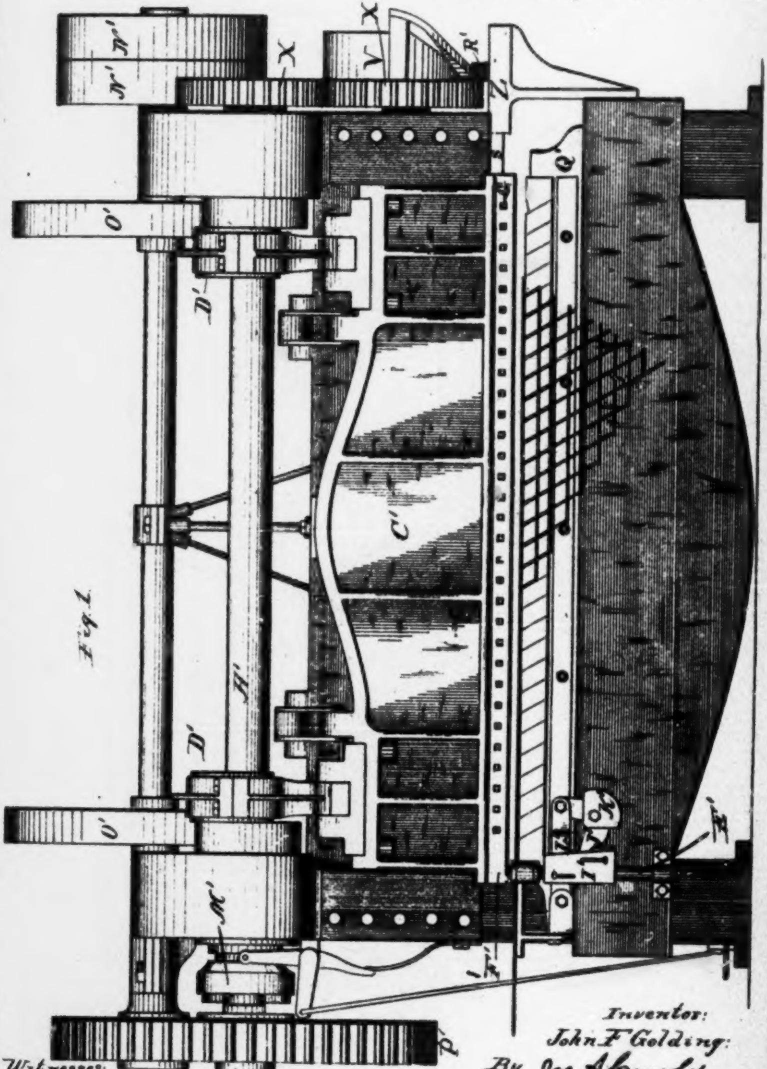
K'
K'
X
V
X
R'
Z
S
Q'
O'
D'
C'
H'
D'
O'
M'
M'
F'
P'
T
T
K
F'

Fig. 1

Witnesses:
Lew C. [illegible]
Alvin A. Cohn

Inventor:
John F. Golding:
By Jas. A. Cowles
his Attorney.

80
126

(No Model.) 7 Sheets—Sheet 2.

J. F. GOLDING.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

No. 381,231. Patented Apr. 17, 1888.

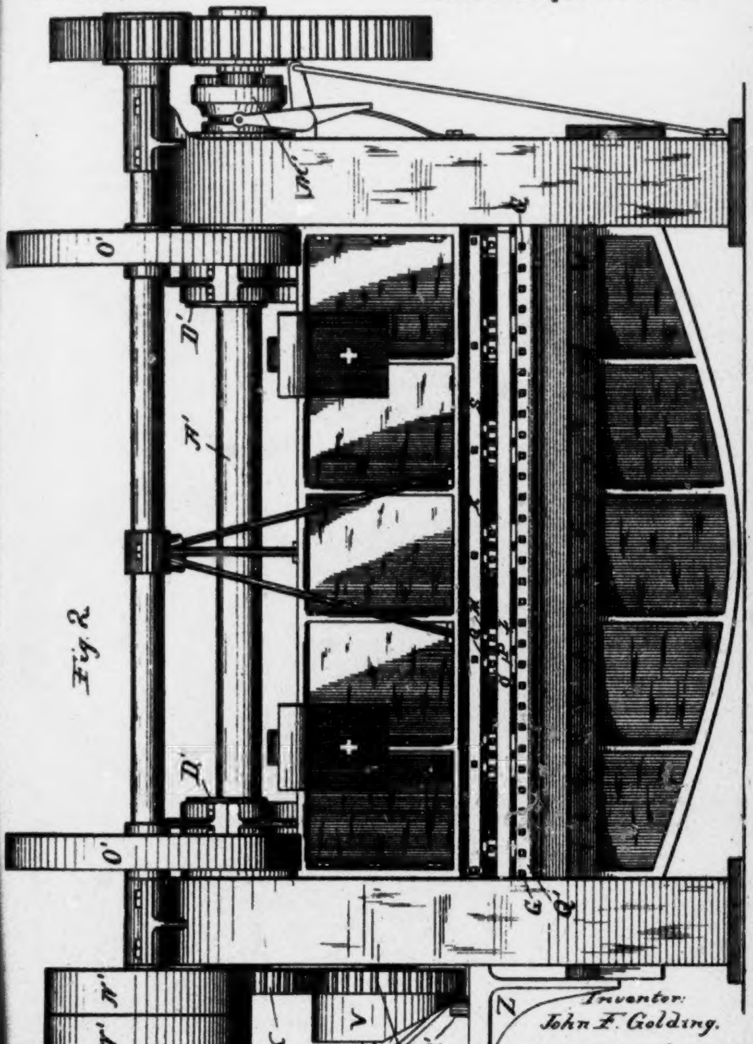
Fig 2
m'
O'
O'
D'
D'
F'
Q
G
Q'
F'
F'
X
V
X
R'
Z

Witnesses:
[illegible]
[illegible]

Inventor:
John F. Golding.
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81
128

(No Model.) 7 Sheets—Sheet 3.

J. F. GOLDING.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

No. 381,231. Patented Apr. 17, 1888.

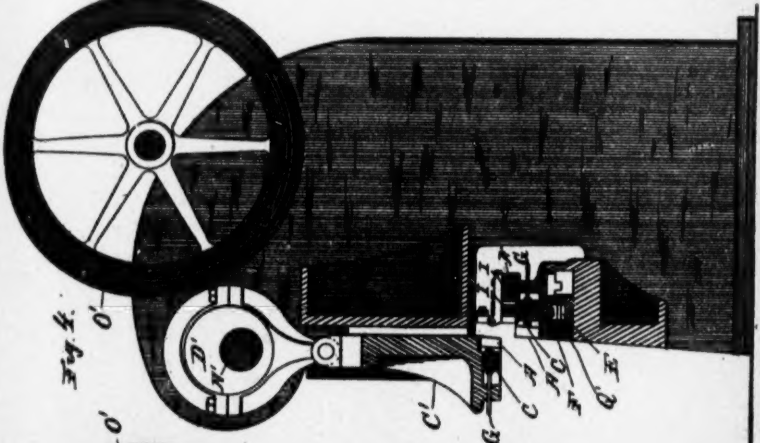
Fig. 4.

O'
D'
K'
C'
G
C
A
A'
F'
Q'
E
I
I

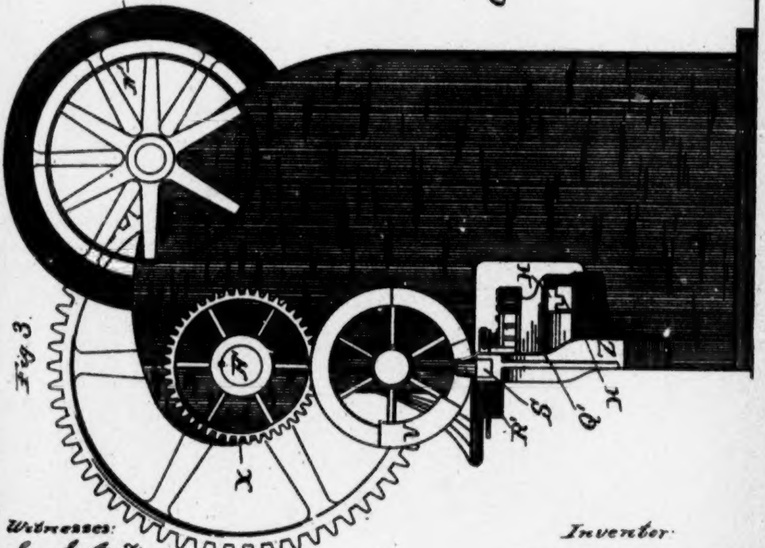
Fig. 3

Witnesses:
Lew. E. Curtis
Melvin A. Cotton

Inventor
John F. Golding
By Jas. A. Cowles
his Attorneys.

82

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(No Model.) 7 Sheets—Sheet 4.

J. F. GOLDING.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

No. 381,231. Patented Apr. 17, 1888.

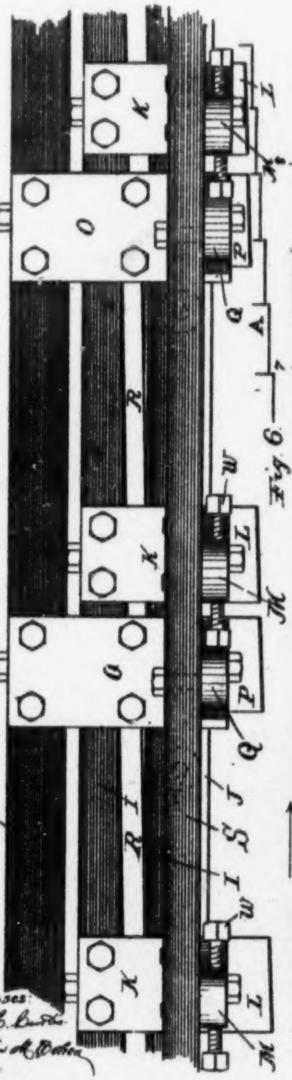
Fig 5
K
O
R
I
F
S
J
W
L
M
P
Q
A
7

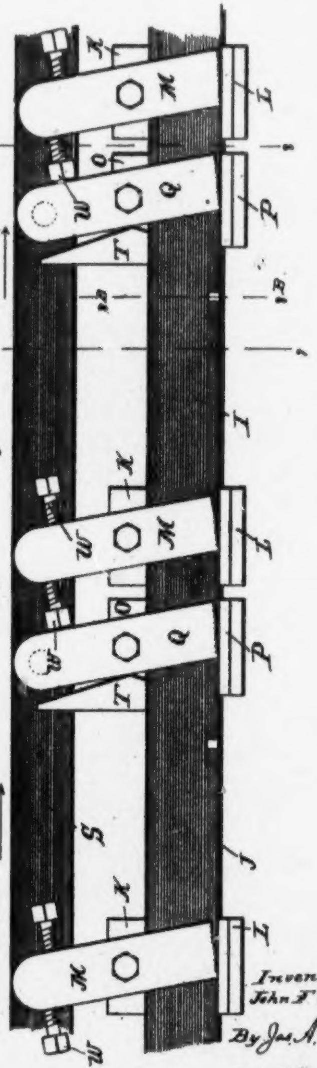
Fig 6
K
M
L
O
Q
P
W
T
8
7
I
S
J

Witnesses:
Saml. C. Burdis
Melvin M. Batson

Inventor:
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his Attorney

83

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(No Model.) 7 Sheets—Sheet 5.

J. F. GOLDING.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

No. 381,231. Patented Apr. 17, 1888.

Fig. 7.

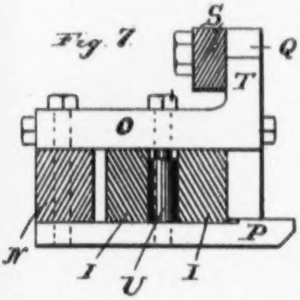


Fig. 8.

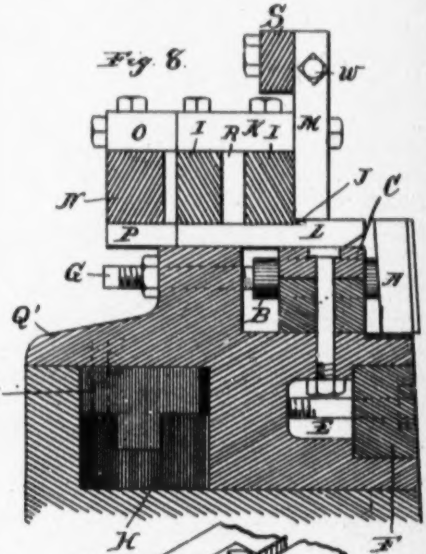

S
W
M
O
I
R
K
I
N
J
C
P
L
G
A
B
Q'
H
E
H
F

Fig. 8.B.

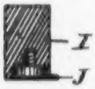
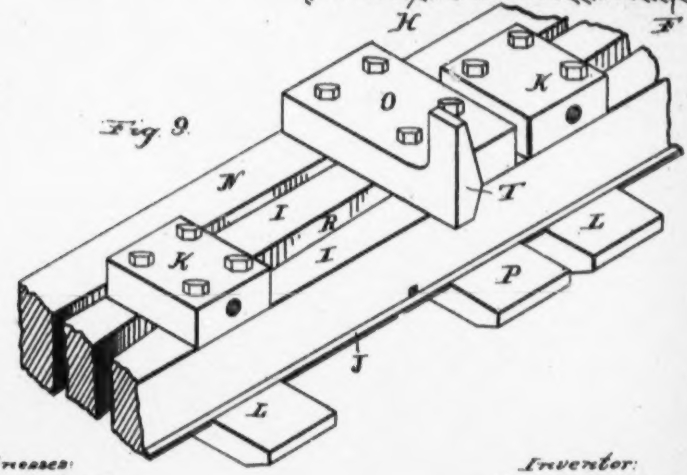


Fig. 9.


O
K
N
I
R
T
I
K
L
P
J
L

Witnesses:
Lew. C. Curtis.
Robin A. Cohen

Inventor:
John F. Golding:
By Jas. A. Cowles
his Attorney.

84

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(No Model.) 7 Sheets—Sheet 6.

J. F. GOLDING.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

No. 381,231. Patented Apr. 17, 1888.

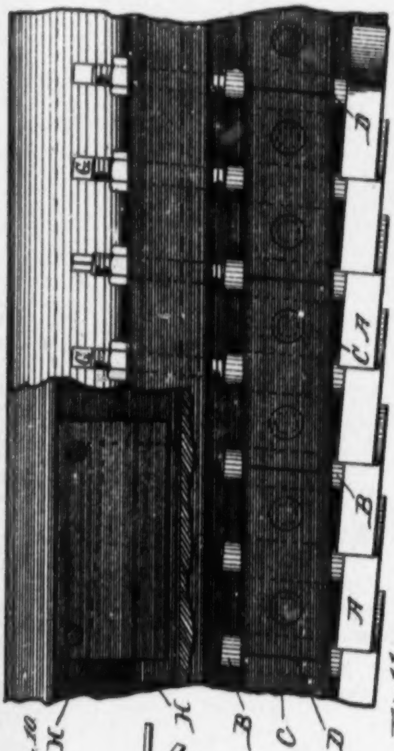
Fig 10
G
G
C
A
B
C A
B
A
H
H
B
C
D

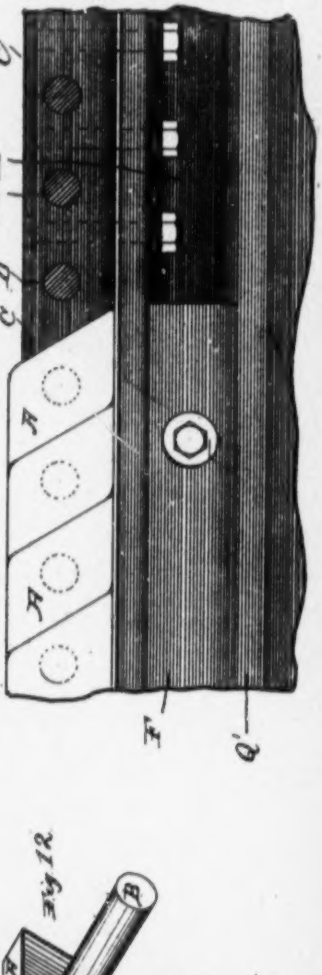
Fig 11
C
B E
B
D
C
A
A
F
Q'

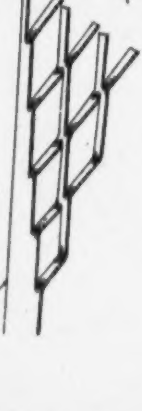
Fig 13

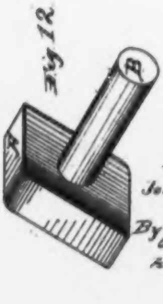
Fig 12

Witnesses:
Lew. E. Curtis
Melvin M. Cohen

Inventor:
John F. Golding
By Jas A Cowles
his Attorney

(No Model.) 7 Sheets—Sheet 7.

J. F. GOLDING.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

No. 381,231. Patented Apr. 17, 1888.

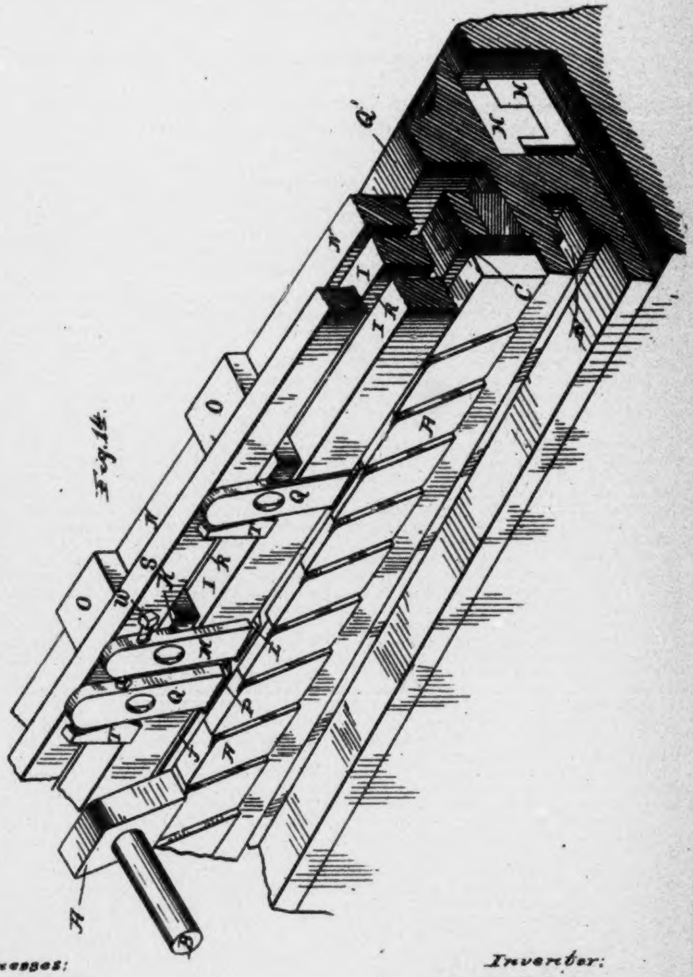
Q'
X
X
A
I
I R
C
B
O
A
A
Q
T
I R
S
U
O
K
Q
P
L
Q
T
J
A
A
D

Fig. 14.

Witnesses:
Lew. E. Curtis.
Albin A. Cohen.

Inventor:
John F. Golding.
By Jas. A. Cowles.
his Att'y

UNITED STATES PATENT OFFICE.

JOHN FRENCH GOLDING, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE EXPANDED METAL COMPANY, OF MISSOURI.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

SPECIFICATION forming part of Letters Patent No. 381,231, dated April 17, 1888.

Application filed January 7, 1887. Serial No. [illegible]. (No model.)

To all whom it may concern:

Be it known that I, JOHN FRENCH GOLDING, a citizen of the United States, residing in the city of Chicago, in the State of Illinois, have invented certain new and useful Improvements in Mechanism for Manufacturing Slashed Metallic Screening, of which the following is a specification.

The nature and object of this invention are to produce a machine for simultaneously cutting and expanding slashed metallic screening in a cheap and efficient manner.

Figure 1 is a front view of the machine, showing a piece of metal in the machine, part of which is cut and expanded. Fig. 2 is a rear view of the machine. Fig. 3 is an end view of the machine. Fig. 4 is a transverse sectional view of machine. Fig. 5 is a plan view of the device for feeding the metal into the machine, and in connection therewith a number of cutters are shown in their proper position. Fig. 6 is a front view of device shown in Fig. 5. Fig. 7 is a transverse sectional view of device shown in Fig. 5. Fig. 8 is a transverse sectional view showing the feeding device in connection with the longitudinal sliding head and lower cutters attached thereto. Fig. 8^a is a detail showing frictional roller in guide-bar. Fig. 9 is a perspective view of a segment of the feeding device. Fig. 10 is a plan view of a segment of the longitudinal sliding head carrying lower cutters. Fig. 11 is a front view of segment of longitudinal sliding head, showing lower cutters in position and the means for securing them to said sliding head. Fig. 12 is a perspective view of one of the cutters. Fig. 13 is a perspective view of a piece of metal, part of which is formed into slashed metallic screening. Fig. 14 is a perspective view, looking from the delivery end of the machine, showing the lower sliding head, cutters, and feeding device.

Similar letters of reference refer to similar parts in the different figures.

The novel features of this invention relate to the feeding and cutting device.

A in Figs. 4, 5, 8, 10, 11, and 12 shows the form of the cutters.

B, Fig. 12, is a stock secured to or integral with each cutter.

C is a clamp for clamping the stock B of cutters A. This clamp is formed of an upper and lower jaw drawn together by suitable bolts. One jaw of this clamp is cut into segments for the purpose of easily removing the cutters, as shown at D, Figs. 8, 10, and 11. There are two of these clamps, each similarly constructed, one of which is secured in the upper part of the lower cutter-head and the other to the lower part of the upper cutter-head, as shown at C, Fig. 4.

E, Figs. 4, 8, 11, and 14, shows a recess in lower cutter-head, through which access is obtained to the nuts of the bolts employed for drawing the jaws of the clamp together. Said bolts also secure the clamp to the said longitudinally-traveling head.

F, Figs. 8 and 11, is a filling-piece placed in said recess E for the purpose of supporting the parts, and is held therein by suitable bolts.

G G in Figs. 1, 2, 4, 8, and 10 are adjusting-screws which pass through the upper part of the longitudinally-traveling head, as shown in Fig. 8, and the lower part of the vertically-traveling head, as shown in Fig. 4, and bear against the stocks B of the cutters for the purpose of adjusting the cutters. These cutters A A are placed edge to edge, their vertical faces being offset in step form, as shown in Figs. 10 and 11, and being of uniform size, each cutter can be adjusted at pleasure by the screws G.

I I, Figs. 4, 5, 6, 7, 8, 9, and 14, are two bars parallel with bar N and fastened to the machine, one of which bars, having the flange J, (see Figs. 8 and 9,) serves to guide the metal to be cut and expanded. To these two bars are secured caps K and shoes L by bolts passing through them, which hold them firmly in position. Caps K carry dogs M, Figs. 5, 6, and 13, which are used to lock the metal in position while it is being cut and expanded.

N, Figs. 5, 7, 8, 9, and 14, is a longitudinally-traveling bar located at rear of bars I I, and carrying caps O O and shoes P, Figs. 5, 6, 7, 8, and 9, said caps and shoes being secured respectively above and below said bar N by suitable bolts, one set of said bolts passing through the space K between bars I I. This bar N travels longitudinally with its dogs Q, Figs. 5, 6, and 14, and is given a lateral movement by the cap-bolts which pass through slot or space R, Figs. 5, 7, 8, and 9, these slots diverging from the face of the flanged bar I in the direction of the forward travel of the bar N.

S, Figs. 5, 7, 8, and 14, is a parallel bar, to which are connected at their upper ends the dogs Q.

T, Figs. 6, 7, 9, and 14, are stops against which the dogs Q strike in their backward movement.

U, Fig/ 7, is a friction roll or slide to prevent wear upon the bolts, securing caps O′ and shoes P′ to bar N in their longitudinal travel.

Bars N and I I are set down in the cut-away part of shoes L and P for the purpose of allowing flange J to extend outwardly from the guide-line, so that the end of the metal feeding over said shoes will be supported thereby in its forward travel.

V, Figs. 1, 2, and 3, is a rotary cam actuating the parallel bar S backward and forward, and is worked by gears X X, operated from the main shaft.

Figs. 6 and 4 show the parallel bar S in its forward position, with its feed-dogs Q thrown against screw W in dogs M, causing said dogs to lock the metal between them and their shoes L. It is while the dogs are all in this position that the cutters operate on the metal.

Z, Figs. 1, 2, and 3, is a bracket supporting and forming guide for end of parallel bar N below the rotary cam.

H H, Figs. 8, 10, and 14, are wedge-shaped pieces which govern the lower sliding head in its lateral movement, causing it to travel parallel with the face of the cutter.

A, Fig. 14, is an upper cutter, shown in its position relative to the lower cutters before the act of cutting begins.

The bar E′, Fig. 1, is connected at its upper end with the upper vertically-moving cutter-head, C′, at the point F′. The bar E′ works in bearings at its lower end. On this bar E′ is the boxing I′.

J′ is a bent lever working on fulcrum K′. At one end it works in a rear boxing, I′. At the other end it is connected to link L′. The other end of this link is attached to and reciprocates the lower cutter-head. The adjusting-screws W, Figs. 5, 6, and 14, are attached to one set of dogs forming bumpers for locking one set.

M′, Fig. 1, is a clutch operated by means of lever beneath it, and used for the purpose of throwing the machine in and out of gear.

N′ N′ are tight and loose pulleys on the counter-shaft of the machine. O′ O′ are fly-wheels on said counter-shaft.

The movements and purposes of this machine are accomplished as follows: Power is conveyed to the machine by a belt running on the tight pulley on the counter-shaft, on which are secured fly-wheels O′ O′ and a spur-gear, the latter meshing with the large gear P′, which runs loosely on main shaft A′. The clutch M′, when thrown into connection with the large gear, operates the shaft A′, which, by means of eccentrics D′ D′, connected by straps and rods to cutter-head C′, gives the latter the requisite vertical movement. At F′ is connected the bar E′, which by its upward and downward movement operates levers J′ and link L′, which latter being connected to the lower longitudinally-sliding head Q′, gives to it its requisite movement. Gears X X, Fig. 3, rotate the cam V, which is secured to one of said gears, said cam giving a longitudinal back and forward movement to parallel bar S, which, being connected to the upper ends of feeding-dogs Q Q, (shown in Figs. 5, 6, 7, 8, and 14,) causes them to lock the metal to be cut between their lower serrated faces and their shoes P, and moves the dogs and the metal thus locked forward the requisite distance, and when about at the end of the forward travel said dogs are brought against the heads of the adjusting-screws in the other set of dogs, causing them also to firmly hold the metal between their lower serrated faces and their shoes, and to hold this interlocked position by means of a dwell on cam V, passing along roller B′, said roller being secured to the bar S. When these dogs remain in this position, the act of simultaneously cutting and expanding the metal is performed, the cutters in the vertically-travelling head-piece passing through the metal, their beveled faces following the beveled faces of the cutters in the lower longitudinally-traveling head Q, which is moved by the bent lever and link connection J′ and I′. When the cutters on the vertically-moving head have passed the lower cutters the requisite distance, the cam quickly returns the parallel bar S, causing bumper T (shown in Fig. 6) to strike against the head of the opposite screw, causing the locking-dogs M M to loose their hold on the metal. While this backward movement of bar S is being performed, the eccentrics D′ D′ being at or about the lowest point of their throw, the cutter-head C consequently has but little movement and the cutters hold the metal in position while the feeding-dogs are making their backward movement. The cut-away part of cam V permits the feeding device to lie dormant while the vertically-traveling head C′ passes upward sufficiently far to clear a space between the cutters, when levers J′ and link L′ operate to return the lower cutter-head to its former position after cam V again has caused another forward feed movement of bar S. The dogs Q Q in their backward and forward movement are also given a side movement corresponding with slightly-angular facings of sides of parallel bars I I (indicated by R) and collar U, fitting therein between said bars, the object being to give a draw movement to the feeding-dogs, and thereby cause the metal to travel closely along the bar I and guide-line J, and to prevent the cutters from drawing the metal away from said line.

It will be observed that wedges H H, Figs. 8 and 10, are a device for imparting the side or lateral movement of lower cutter-head, the lower part of same being secured to lower bed of machine and the upper part to the sliding head, the purpose of this being to cause said cutters to travel backward and forward parallel with their faces. The inclination of the wedges H H is determined by the angle at which the lower cutters are set. The faces of the upper cutters are set to correspond with the faces of the lower cutters, and consequently fit into the lower cutters in their travel. The object in having a lateral travel to the lower head is that the cutters in the vertically-traveling head may be immediately beneath and in line with the main shaft of the machine.

The bars I I may be made in one piece and slotted to accomplish the same purpose.

I claim—

1. In a machine for manufacturing slashed metallic screening, the combination of two cutter-heads with cutters in each head being set edge to edge, and their faces being set at an angle with each line of said cutters in step form and adjustable backward and forward in the angle in which they are set.

2. A movable cutter having a center stock and four cutting sides, two of said cutting sides being parallel with each other and oblique to the other two cutting sides.

3. In a machine for manufacturing slashed metallic screening, the combination of fixed guide-bars provided with spaces or slots within, through, or between them, said spaces or slots diverging in a greater or less degree from the line of the guide in said bars in the direction of the feed, with suitable feeding mechanism.

4. In a machine for manufacturing slashed metallic screening, the combination therewith of an intermittent feeding device, consisting of an actuating-bar loosely attached to one end of one or more locking-dogs, said dogs being loosely secured at or near their centers to journals and clamping against jaws at their opposite ends, said journals and jaws being securely attached one above the other to a bar or bars connecting the requisite number of said journals and jaws, all of said parts being held in their respective positions by a guide-bar fixed to the main frame of the machine.

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No. 664,379. Patented Dec. 25, 1900.

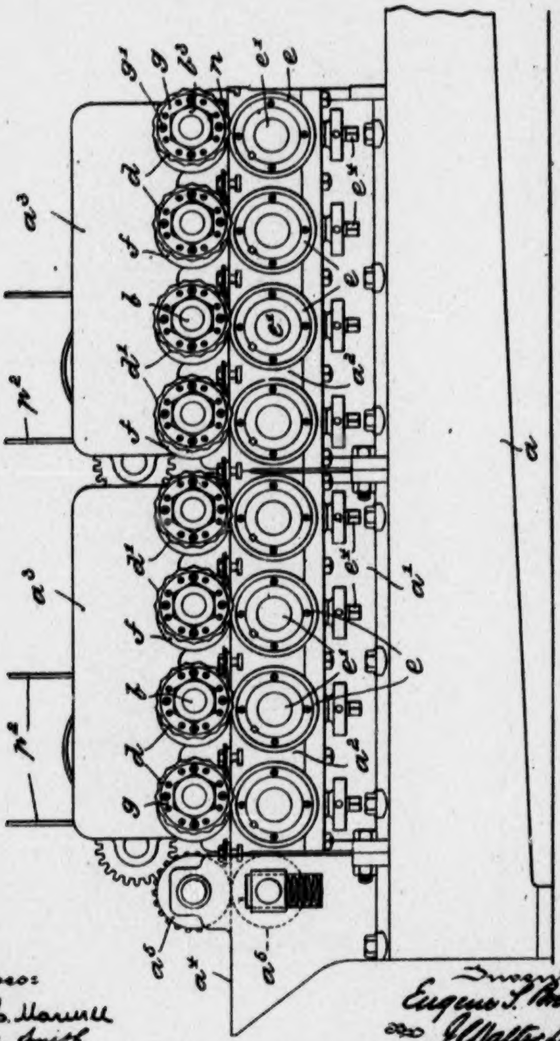
E. S. BRADFORD.

MACHINE FOR MAKING EXPANDED METAL.

(Application filed Sept. 8, 1900.)

(No Model.) 6 Sheets—Sheet 1.

Fig. 1.


g1
g
e3
n
e1
e
d
a3
f
b
e1
d1
a2
p2
e4
a
a1
e
a2
a5
a4
a6

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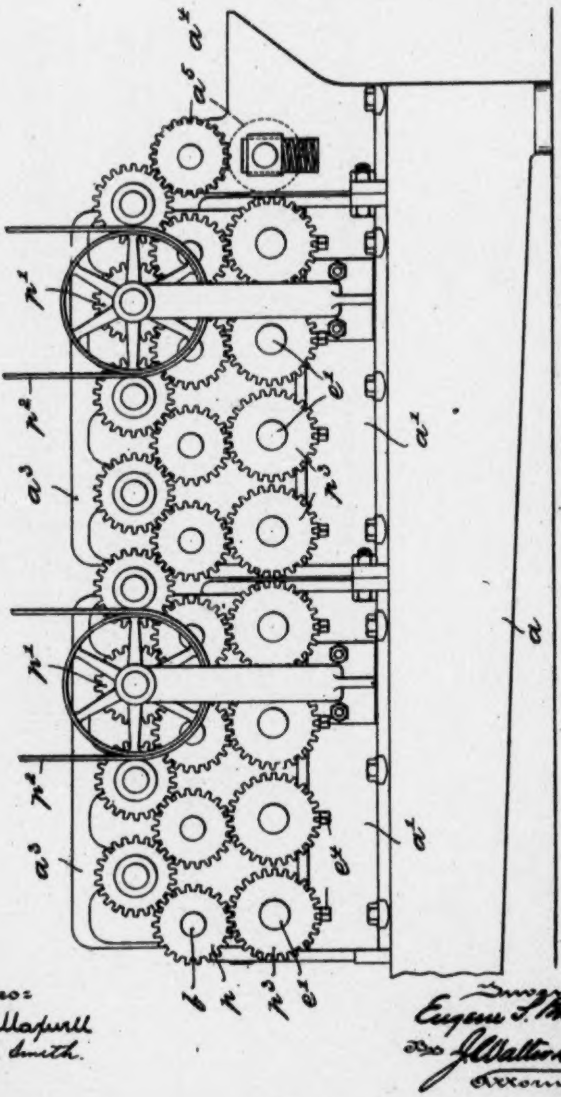
MACHINE FOR MAKING EXPANDED METAL.

(Application filed Sept. 5, 1899.)

(No Model.) 6 Sheets—Sheet 2.

Fig. 2.



a⁵
a⁴
p¹
p²
a³
e¹
p³
a¹
a
p¹
p²
a³
e⁴
a¹
b
p
p³
e¹

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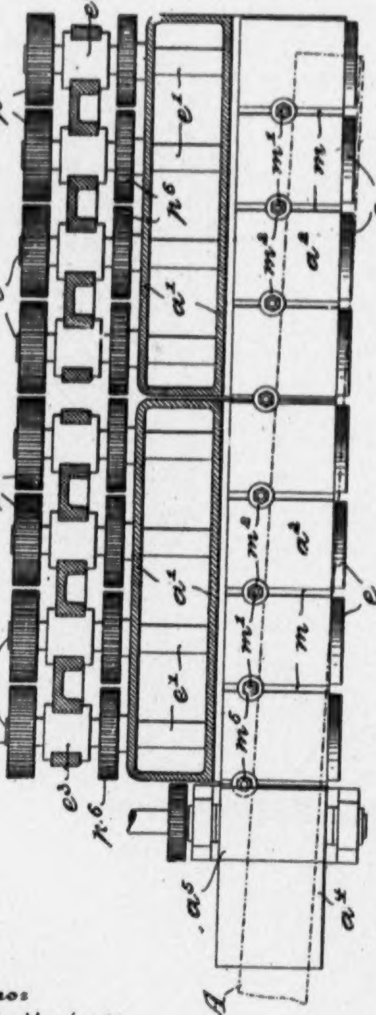
MACHINE FOR MAKING EXPANDED METAL.

(Application filed Sept. 5, 1899.)

(No Model.)

6 Sheets—Sheet 3.

Fig. 8.



e³
p³
e¹
p⁶
e¹
a¹
m¹
m
m²
a²
e
m⁶
a⁵
a⁴
A

Fig. 11.

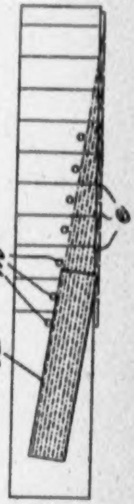


Fig. 10.

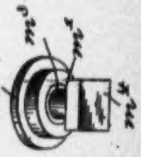
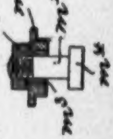


Fig. 9.



m⁶
m²
m¹
s⁴m
s³m

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MACHINE FOR MAKING EXPANDED METAL.

(Application filed Sept. 6, 1899.)

(No Model.) 6 Sheets—Sheet 4.

Fig. 4.

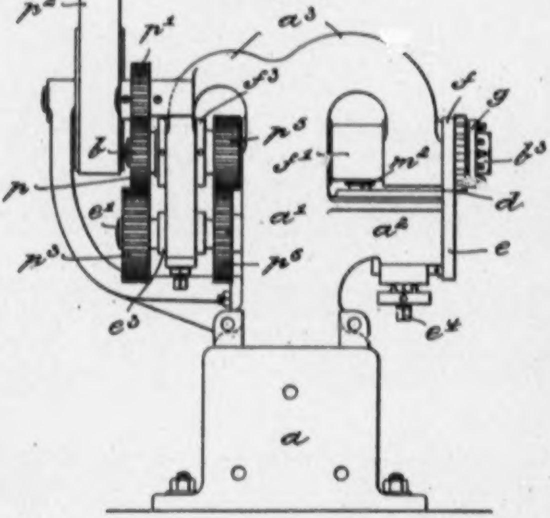
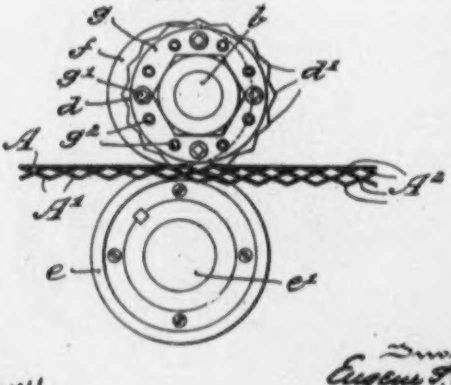

p^2
p^1
a^3
f^3
f
g
f^5
p^5
f^2
m^2
d
b
p
e^2
a^1
a^2
e
p^3
p^6
e^3
e^4
a

Fig. 12.


g
b
f
d^1
g^1
d
A
g^2
A^2
A^1
e
e^1

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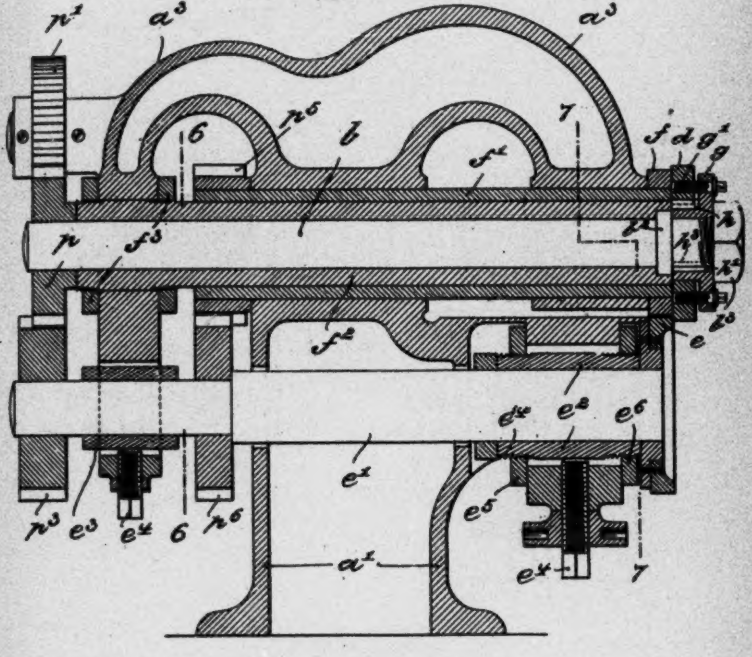
MACHINE FOR MAKING EXPANDED METAL.

(Application filed Sept. 5, 1899.)

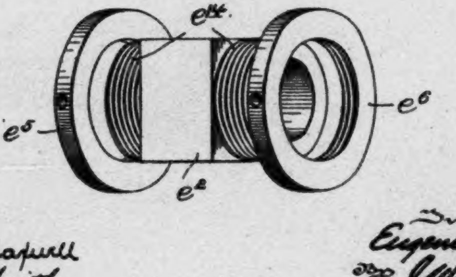
(No Model.) 6 Sheets—Sheet 5.

Fig: 5.



p1
a3
a3
p6
6
b
7
f1
f
d
g1
g
h
b2
h3
h2
p
f3
f2
e
e3
e4
e2
e6
e1
e5
e4
7
p3
e3
e4
6
p6
a1

Fig: 13.



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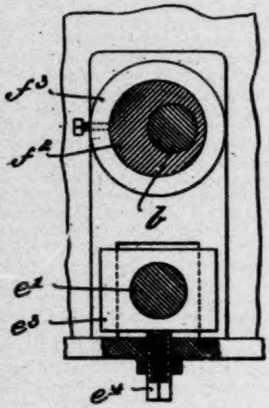
MACHINE FOR MAKING EXPANDED METAL.

(Application filed Sept. 5, 1899.)

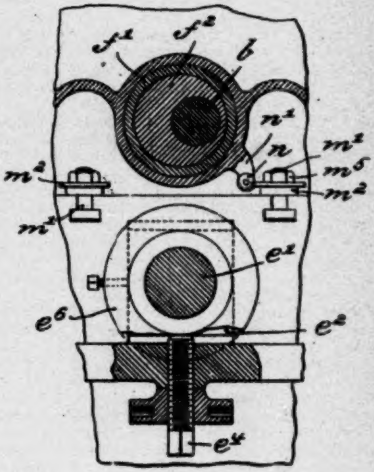
(No Model.) 6 Sheets—Sheet 6.

Fig: 6.



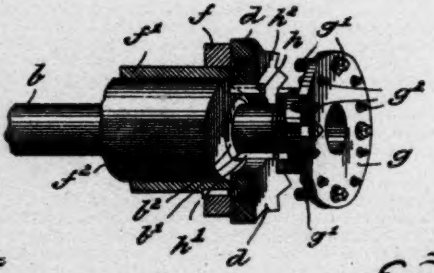
f^3
f^2
b
e^1
e^3
e^4

Fig: 7.



f^1
f^2
b
n^1
n
m^1
m^5
m^2
m^2
m^2
m^1
e^1
e^6
e^2
e^4

Fig: 8.



f^2
f
d
h^2
h
g^1
g^2
b
g
f^2
b^2
b^1
h^1
d
g^1

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MACHINE FOR MAKING EXPANDED METAL.

SPECIFICATION forming part of Letters Patent No. 664,879, dated December 25, 1900.

Application filed September 5, 1899. Serial No. 729,423. (No model.)

To all whom it may concern:

Be it known that I, EUGENE S. BRADFORD, a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Machines for Making Expanded Metal, of which the following is a specification.

My invention has relation to a machine adapted to form sheet metal into a reticulated or mesh-like structure, and in such connection it relates more particularly to the construction and arrangement of such a machine.

Heretofore in machines used for a similar purpose the sheet metal has been slit and expanded into the form desired either by subjecting it to the action of two converging series of rotary cutters and expanders or to the action of reciprocating knives.

The machine of my present invention differs essentially from preceding machines in that but a single series of rotary cutters and expanders is required, the metal being fed to these cutters or expanders at an angle.

The principal object of my invention is therefore to provide a machine for expanding metal, having but a single series of rotary expanding-cutters arranged in alinement, the sheet of metal being fed to these cutters at an angle to the plane in which the cutters rotate.

Further objects of my present invention are, first, to provide, in conjunction with the single series of expanding-cutters, a series of circular cutters, replacing the stationary or reciprocatory knives formerly used; second, to locate these circular cutters slightly in advance of the expanding-cutters, so that the circular cutter may act as a support for the metal during the shearing and expanding operations; third, to provide, in conjunction with the expanding-cutters and circular cutters, a feed-roller located eccentrically with respect to the shaft of each expanding-cutter, so as to be directly above the circular cutter and to assist said circular cutter in the feeding of the sheet; fourth, to provide each expanding-cutter with a holder which can be readily and quickly secured or removed from the shaft of the expanding-cutter by means of a single nut and to which holder the expanding-cutter is firmly secured; fifth, to provide set and binding screws by means of which the expanding-cutter may be adjusted on its holder toward or away from the face of the circular cutter; sixth, to provide an expanding-cutter, its shaft, and the holder for securing the cutter to said shaft with splines or keys, whereby the cutter when removed from the shaft may be replaced thereon to occupy the same relative position with respect to its expanding-prongs as it did prior to its removal from the shaft; seventh, to provide in such a machine a bed or table over which the metal is fed, said bed being provided with a series of transverse slots, wherein guide-rolls are adapted to be adjusted, said guide-rolls determining the relative angle at which the metal is to be presented to the cutters; eighth, to provide in such a machine means whereby the expanding-cutters and their shafts may be arranged eccentrically with respect to the feed-rollers on said shafts, so as to permit the feed-rollers to rotate directly above the lower circular cutters and the expanding-cutters to rotate a little beyond the circular cutters; ninth, to provide means for adjusting the shafts of the lower set of cutters transversely and vertically in the machine with respect to the frame, so as to compensate for wear and tear upon the cutters, as well as permit sheets of varying thickness to be cut, and, tenth, to provide adjacent to and in the rear of each expanding-cutter a stripping-roll adapted to prevent the expanded metal from buckling upward in the machine.

My invention, stated in general terms, consists of a machine for expanding metal constructed and arranged in substantially the manner hereinafter described and claimed.

The nature and scope of my invention will be more fully understood from the following description, taken in connection with the accompanying drawings, forming part hereof, in which—

Figure 1 is a front elevational view of a machine embodying the main features of my invention. Fig. 2 is a rear elevational view of the same. Fig. 3 is a horizontal sectional view taken on a plane directly above the lower or circular cutters. Fig. 4 is an elevational view of the feeding end of the machine, a part of the feeding-table being removed. Fig. 5 is an enlarged transverse sectional view of Fig. 4. Fig. 6 is a vertical sectional view on the line 6 6 of Fig. 5. Fig. 7 is a similar view on the line 7 7 of Fig. 5. Fig. 8 is an enlarged perspective view, sectioned and partly broken away, of the expanding-cutter, its holder, and auxiliary parts. Figs. 9 and 10 are detail views illustrating the construction and arrangement of one of the guide-rolls. Fig. 11 is a diagrammatic view illustrating the manner in which the sheet metal is presented to the cutters. Fig. 12 is a front elevational view of the expanding-cutter and the circular cutter, illustrating the manner in which the meshes are formed in the sheet; and Fig. 13 is a perspective detail view of the adjustable bearing-block for the shaft of one of the lower or circular cutters.

Referring to the drawings, *a* represents the base or support of the machine, upon which is supported the vertical frame *a'*, in which the various shafts of the machine are supported. From the vertical frame *a'* projects the lateral extension *a²*, which forms the feeding-bed of the machine. From the top of the vertical frame *a'* extends an arched framework *a³*, which forms an auxiliary support for the shafts *b* and accessories carrying the expanding-cutters *d*. The expanding-cutters *d* are all arranged in alinement at the front of the machine, as illustrated in Figs. 1 and 4, and the sheet of metal A is fed from a feeding-table *a⁴* by means of two feed-rolls *a⁵* to the feeding-bed *a²* and is presented to the action of the expanding-cutters *d* at an angle more or less acute, as desired.

In Fig. 11 the feeding of the sheet A to the cutters is illustrated in diagram. In conjunction with the expanding-cutters *d* at the front of the machine is located a series of circular cutters *e*, having their shafts *e'* arranged below the feeding-bed *a²* slightly in advance of the shafts *b*, carrying the expanding-cutters *d*, as clearly illustrated in Figs. 1, 6, 7, and 12. The periphery of each cutter *e* thus serves as a support for the sheet during the expanding and shearing of the same by the expanding-cutters *d*.

The cutting and expanding of the metal is accomplished in the following manner: The expanding-cutter *d* is in the form of a star having expanding-prongs *d'*. The inner face of each prong acting in conjunction with the outer face of each circular cutter *e* serves to shear or slit the sheet A. The prongs *d'* then expand the portion slit to form the meshes A', as clearly illustrated in Fig. 12. In conjunction with the periphery of each circular cutter the metal is supported or clamped and continuously fed by a feed-roller *f*, which rotates eccentrically with respect to the shaft *b* of each expanding-cutter *d* and directly above the periphery of each circular cutter *e*. The axes of the feed-rollers *f* and expanding-cutters *d* all lie in the same horizontal plane; but by reason of the eccentric relationship of each feed-roller to a shaft *b* of a corresponding expanding-cutter the feed-rollers rotate slightly in the rear of the expanding-cutters.

The preferred manner of arranging the feed-roller *f* with respect to the shaft *b* is illustrated in detail in Figs. 5, 6, 7, and 8 and is as follows: The frames *a'* and *a³* have tubular bearings, in which is adapted to rotate a sleeve *f'*, carrying the feed-roller *f*. Within the sleeve *f'* is located a fixed cylindrical block *f²*, upon which the sleeve *f'* is designed to rotate and within which is located eccentrically the shaft *b*, which rotates upon the block *f²* as a bearing. The block *f²* is clamped, by means of collars *f³ f³*, to a portion of the arched frame *a³*, so as to prevent its turning in said frame. The expanding-cutter *d* is preferably not secured directly to the shaft *b*, but is carried by a holder or cap *g*. This cap *g* has a central orifice and is adapted to slip over the projecting screw-threaded end *b'* of the shaft *b* until it fits against a collar *b²* of said shaft. A nut *b³* serves to clamp the cap *g* down upon the collar, as clearly illustrated in Figs. 5 and 8.

The star-cutter *d* is secured to the cap or holder *g* in the following preferred manner: A series of set-screws *g²* are adapted to advance the cutter *d* from the cap *g* toward the lower or circular cutter *e* until the inner periphery of the expanding-cutter *d* is at the prescribed distance away from the outer periphery of the lower or circular cutter *e* to permit of a clear shearing or cutting of the sheet. A series of binding-screws *g'* serve to lock the expanding-cutter *d* against the force of the set-screws *g²*, and thus prevent accidental loosening of said expanding-cutter *d*.

In arranging the star or expanding cutters *d* in alinement, as illustrated in Fig. 1, the prongs *d'* of the various cutters do not occupy the same relative position with respect to the axis of the lower cutters *e*. Thus, beginning at the left of Fig. 1, it will be observed that the first cutter *d* has its expanding-prong *d'* slightly in the rear of the axis of its complemental lower cutter *e*, whereas the next expanding-cutter *d* is turned so that its prong *d'* is almost directly in line with said axis. This alternate arrangement is followed throughout the series of expanding-cutters *d*. The reason for this arrangement is obvious. In the formation of the meshes A' in the sheet A each alternate row of half-meshes (see Fig. 12) is cut by alternate cutters *d*, and the points A³ of expansion of the meshes A' will therefore not be in the same line in adjacent rows, but will fall in the same line in alternate rows. This results in the formation of diamond-shaped meshes, as clearly illustrated in Fig. 12. When now for any reason a star or expanding cutter *d* is to be removed from its shaft *b* and then replaced, it is necessary that when replaced its prongs shall occupy the same relative position as they did prior to the removal of the cutter from its shaft. A simple and efficient means for accomplishing this is illustrated in Figs. 5 and 8 and consists in preferably supplying the cap or holder *g* with two keys *h* and *h'*, one of which, *h*, is adapted to enter a keyway h^2, formed in the cutter *d*, and the other, *h'*, is adapted to enter a keyway h^3 in the shaft *b*.

Referring now to Figs. 3, 9, and 10, the preferred manner of guiding the sheet A on the bed a^2 is illustrated. In the bed a^2 is formed a series of transverse slots *m*, in which are adapted to slide the bolts *m'*, each carrying at its upper end a flanged roll m^2, adapted, preferably, to turn upon a washer or sleeve m^3, surrounding the body of the bolt and interposed between its head m^4 and the clamping-nut m^5. The bolts *m'*, with their guide-rolls m^2, are slid in the slots *m* until they are alined along the bed at the requisite angle to the edge of the bed a^2, and then they are clamped by the nuts m^5 and heads m^4, so as to prevent movement in the slots. It is to be understood that by shifting the bolts and guide-rolls along the slots the line of guide-rolls may be changed to make a more or less acute angle with the line of cutters *d* and *e* than the angle shown in the drawings.

In machines of this type the wear and tear upon the revolving cutters must be compensated for, and for this purpose the shafts *e'* are arranged in boxes e^2 and e^3, adapted to slide in bearings and to be adjusted up and down in said bearings by means of set-screws e^4. A preferred form of box is illustrated in Fig. 13, and its arrangement in the machine is shown at Fig. 5. To compensate for different thickness of metal to be cut and expanded, the cutters *e* and *d* should be adapted to be brought into more or less close relationship with each other, according to the thickness of the sheet. One way of accomplishing this is to give either shaft *b* or *e'* a transverse movement in the frame of the machine. In Fig. 5 the lower shaft *e'* is adapted to be thus shifted, and for this purpose one of the boxes e^2 is screw-threaded, as at e^{14}, to receive the collars e^5 and e^6, which when advanced on the box will serve to clamp the box to its bearing and when retracted will permit of the shifting of said shaft and box slightly in the bearing to occupy a required position, when the collars may again be tightened and the box locked in its new position. In the cutting and expanding of the sheet by means of an upper and lower rotary cutter the metal has a tendency to buckle upward in the machine. To prevent this and to assist in stripping the metal from the prongs of the expanding-cutters *d*, there is provided at the rear of each cutter *d* a stripping-roll *n*, suspended from the frame a^2 and rotating in a bracket *n'* in said frame. To properly feed and operate upon the metal, it is necessary that the star or expanding cutters *d*, the lower or circular cutters *e*, and the feed-rollers *f* shall all rotate in the same direction and at the same speed. To accomplish this, there is secured, as illustrated in Figs. 2 and 5, upon each shaft *b* a gear-wheel *p*, meshing with a drive gear-wheel *p'*, to which motion is conveyed in any suitable manner from a source of power (not shown) by means of belts p^2. The gear-wheel *p* on shaft *b* meshes with a similar gear-wheel p^3 on the shaft *e'*. Motion is conveyed to the sleeve *f'*, carrying the feed-rollers *f*, by securing a gear-wheel p^4 on said sleeve and meshing said gear-wheel p^5 with a similar gear-wheel p^6, carried by the shaft *e'*, all as clearly illustrated in Fig. 5.

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a machine for expanding metal, a single series of rotary expanding-cutters arranged in alinement and means for feeding the metal at an angle to the plane in which said cutters rotate, substantially as and for the purposes described.

2. In a machine for expanding metal, a single series of rotary expanding-cutters arranged in alinement, a series of rotary circular cutters arranged below and coacting with the expanding-cutters, and means for feeding the metal at an angle to the plane in which the coacting cutters rotate, substantially as and for the purposes described.

3. In a machine for expanding metal, a single series of rotary expanding-cutters arranged in alinement and a series of rotary circular cutters arranged below and coacting with the expanding-cutters, the axes of said circular cutters being arranged slightly in advance of the axes of the expanding-cutters, substantially as and for the purposes described.

4. In a machine of the character described, a single series of rotary expanding-cutters arranged in alinement, a series of rotary circular cutters arranged below and coacting with the expanding-cutters, the axes of said circular cutters being arranged in advance of the axes of the expanding-cutters, and a series of feed-rollers arranged eccentrically on the axes of the expanding-cutters directly above the circular cutters and having their axes of rotation in line with the axes of rotation of the lower circular cutters, substantially as and for the purposes described.

5. In a machine of the character described, a cutter having a series of expanding-prongs, a cap or holder for said cutter, a series of binding-screws adapted to secure the cutter to the cap or holder, and a series of set-screws adapted to bear against the cutter to lock the same and to prevent accidental loosening of said cutter, substantially as and for the purposes described.

6. In a machine of the character described, an expanding-cutter, a shaft and a cap or holder for said cutter, said cap being provided with two keys, one of which is adapted to se-

cure the cutter to the holder and the other to secure the holder to the shaft, substantially as and for the purposes described.

7. In a machine of the character described, a single series of rotary expanding-cutters arranged in alinement, a feeding-bed above which the expanding-cutters rotate and provided with a series of transverse slots, a single series of rotary circular cutters arranged below and coacting with the expanding-cutters, and a series of guide-rolls adapted to be adjusted in the slots of the bed, to constitute a means for feeding the metal at an angle to the plane in which the coacting cutters rotate, substantially as and for the purposes described.

8. In a machine of the character described, an expanding-cutter, a shaft carrying said cutter, a cylindrical bearing-block in which said shaft is eccentrically located, a sleeve adapted to rotate upon the exterior of said block, and a feed-roller carried by said sleeve, substantially as and for the purposes described.

9. In a machine of the character described, a single series of expanding-cutters and their shafts, a single series of circular cutters coacting with said expanding-cutters and having their shafts arranged below the expanding-cutters and shafts, means for feeding the metal in the direction of rotation of said coacting cutters and means for feeding said metal at an angle to the plane of rotation of said coacting cutters, substantially as and for the purposes described.

In testimony whereof I have hereunto set my signature in the presence of two subscribing witnesses.

EUGENE S. BRADFORD

Witnesses:

J. WALTER DOUGLASS,
THOMAS M. SMITH.

143 Circuit Court of the United States, Eastern District of Pennsylvania. In Equity.

No. 14. April Sessions, 1903.

THE EXPANDED METAL COMPANY and HENRY CHESS, WALTER CHESS, and HARVEY B. CHESS, Co-partners, Trading as Chess Brothers, Complainants,

vs.

EUGENE S. BRADFORD, JOSEPH C. MILLICHAMP, NICHOLAS J. SCHMUCKER, JR., and NICHOLAS J. SCHMUCKER, Respondents.

Answer.

The joint and several answers of Eugene S. Bradford, Joseph C. Millichamp, Nicholas J. Schmucker, Jr., and Nicholas J. Schmucker, all of the city and county of Philadelphia, in the State of Pennsylvania, respondents, to the bill of complaint of The Expanded Metal Company and Henry Chess, Walter Chess, and Harvey B. Chess, co-partners trading as Chess Brothers, Complainants.

The respondents, now and at all times hereafter saving and reserving to themselves, all benefits and advantages of exception which can or may be had or taken to the many errors, uncertainties and other imperfections in said complainants' Bill of Complaint, 144 for answer thereunto, or unto as much and such parts thereof as the respondents are advised is or are material, or necessary for the respondents to make answer unto, say:

I. The respondents are not informed save by the Bill of Complaint that the complainant, The Expanded Metal Company, is a corporation duly organized under the laws of the State of Missouri or that it maintains an office at St. Louis in said State, and also at Chicago in the State of Illinois, or that it is a Citizen of said State of Missouri, and therefore deny the same and leave the complainants to make such proof thereof as it and they may deem necessary; and the respondents are not informed save by the Bill of Complaint, that Henry Chess, Walter Chess and Harvey B. Chess are citizens of the State of Pennsylvania and reside at Pittsburg, in said State of Pennsylvania, or are co-partners trading as Chess Brothers, and therefore deny the same and leave the complainants to make such proof thereof as it or they may deem necessary.

II. The respondents deny that before the seventh day of May, 1894, John F. Golding of Chicago, Illinois, was the original and first inventor of the new and useful method of making expanded sheet metal, or that it was not known or used by others in this country or patented or described in any patent or printed publication in this or any other country before his invention or discovery thereof, or that it was not, at the time of the application for a patent mentioned in said Bill of Complaint, on sale or in public use for two years, or that the said alleged invention had not been abandoned.

III. The respondents admit upon information and belief, that the United States Letters Patent, No. 527,242, dated the 9th day of October, 1894, were issued and delivered to The Expanded Metal Company, but whether the said The Expanded Metal Company
145 mentioned in said Letters Patent is the complainant
herein, the respondents are not informed, and leave the complainants to make such proof thereof as it may deem necessary; and the respondents further answering, deny that the said John F. Golding was the inventor of said alleged improvement mentioned in the Bill of Complaint, and while admitting upon information and belief that said John F. Golding made application for the Letters Patent thereof, deny that he complied in all respects with the conditions and requirements of the Act of Congress, or that he duly executed and delivered an instrument in writing, assigning unto the said The Expanded Metal Company, its successors and assigns, all his right, title and interest in and to said alleged invention, the application for Letters Patent therefor, and the Letters Patent that might be granted thereon, or that said Letters Patent were issued in due form of law and delivered to the complainants herein, The Expanded Metal Company, or that said Letters Patent granted to the complainant, The Expanded Metal Company, its successors or assigns, the full and exclusive right to make, use and vend said alleged patented improvement as alleged in said Bill of Complaint and leave the complainants to make proof thereof.

IV. The respondents further answering, deny that said Henry, Walter and Harvey B. Chess, trading as Chess Brothers, became at any time or are now, trading as Chess Brothers, the successors of the firm of Chess, Cook & Co., of Pittsburg, in the State of Pennsylvania, and deny that there ever existed in said Pittsburg a firm of Chess, Cook & Company, and further deny that said Chess, Cook & Company, or its successors, said Henry, Walter and Harvey B. Chess, trading as aforesaid, became at any time or are now, the sole and exclusive licensees to make, use and sell to others within the
146 States of New York, Pennsylvania, New Jersey, Delaware,
West Virginia and Ohio, expanded metal made in accordance with the alleged invention and improvement set forth in said Letters Patent No. 527,242, and deny that any agreement in writing was made at any time between the complainants, The Expanded Metal Company, and the said firm of Chess, Cook & Company, granting any or sole and exclusive license under said Letters Patent, or that said Henry, Walter and Harvey B. Chess, trading as aforesaid, ever became or are now the sole and exclusive licensees to make use and sell the said alleged improvement and invention in the territory aforesaid, in view of and under any alleged license granting to said firm of Chess, Cook & Company by the said The Expanded Metal Company.

V. The respondents further answering, deny that the complainant mentioned in the said Bill of Complaint, The Expanded Metal Company at any time became or is now possessed of the entire right,

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title and interest in and to said Letters Patent No. 527,242, or that the said Henry, Walter and Harvey B. Chess were at any time, or at the time of the alleged acts mentioned in said Bill of Complaint, or are now possessed of the exclusive right to practice the alleged method described in said Letters Patent No. 527,242, or have the exclusive right within said territory to sell to others the product thereof.

VI. The respondents further answering, deny that the alleged invention or discovery alleged to be patented in said Letters Patent No. 527,242, is a great benefit and utility, or that it has been and is exclusively used by the complainants named in said Bill of Complaint in the manufactre of expanded metal, or that through any efforts of said complainants, their agents and licensees, the said expanded metal has become widely and extensively introduced and used, or has been extensively introduced or is widely and extensively used throughout the United States and other countries, or
147 that it is very widely known, or that the complainants have
been at any great labor and expense to introduce said expanded metal to be used, or that said complainants have successfully introduced said expanded metal into use.

VII. And further answering, the respondents deny that the public have recognized generally or in any way, the alleged rights of the complainants under the said Letters Patent, or have acquiesced in any way or generally in the rights of said Letters Patent, and deny that the complainants have been in receipt and enjoyment of any or large profits from the use of the said alleged invention.

Respondents further answering, deny that after the issuance of said Letters Patent No. 527,242, the complainants put the invention into use, and avers that the said method of making expanded metal described in said Letters Patent No. 527,242, is impracticable, and embodies superfluous and unmechanical details which are not used by the defendants herein, and that the method described in said Letters Patent has been found in practice to be worthless and valueless.

VIII. The respondents further answering, deny that they have conspired or confederated together to injure the complainants herein, or have done or committed any acts against or in violation of any alleged rights of the complainants herein, or that they have joined together under the name of "Diamond Metal Lath Company" for the purpose of infringing upon any rights of the complainants herein, or of infringing any alleged rights of the complainants herein in said Letters Patent, and the respondents further answering deny that they have jointly infringed upon said Letters Patent or upon the alleged exclusive rights of the complainants thereunder at any time, or since the date when the complainants Henry,
148 Walter and Harvey B. Chess alleged to have become exclusive
territorial licensees thereunder, and respondents further answering deny that they have manufactured expanded sheet metal by practicing the method or by substantially practicing the method of making expanded sheet metal, as described or as substantially described in said Letters Patent No. 527,242, and deny that any acts

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or doings of these respondents are contrary to equity and good conscience, or are an infringement of any rights of the complainants, or that the respondents herein have made any or great gains and profits by any acts or doings alleged to have been committed by the complainants, or that any acts or doings of the respondents herein have been to any great loss and injury of the said complainants.

IX. The respondents further answering, aver that they are advised and so charged, that in view of the state of the art at and before the alleged making by the said John F. Golding, of the alleged invention and improvement in the method of making expanded sheet metal described and claimed in said Letters Patent No. 527,242, and in view of what was then known and used in the art, the method described in said Letters Patent involved no substantial change in the principle of the method and the practice of making expanded sheet metal of prior methods, but said method was nothing more than obvious changes of invention, and that said Letters Patent do not describe, specify nor claim a method that is patentable under the statutes of the United States under such cases made and provided and for these reasons said Letters Patent No. 527,242 were and are null and void.

X. The respondents, further answering, aver that they are advised and so charge, that in view of the state of the art as it existed at a prior date to that of the said alleged invention of John F. Golding, described and claimed in said Letters Patent No. 527,242,
149 and by reason of the rejection by the Patent Office of certain
claims submitted and part of the original specification of said Letters Patent in suit. and of the acquiescence in said rejection by the applicant, and the patentees, and by his and its compliance therewith in the amendment of and reconsideration of said claims by him and to them the said patentee, The Expanded Metal Company, and its alleged assignees, the complainants herein are estopped from contending for a construction of any claims for said patent broad enough to include or dominate any method of making expanded sheet metal alleged to be practiced by the defendants herein and against which this suit is brought, and that even if the claims of said patent can be construed broadly for such purposes, then said Letters Patent are null and void.

XI. Respondents further answering, aver, on information and belief, that the said John F. Golding, was not the true, original and first inventor of said alleged and pretended new and useful method of making expanded sheet metal described, shown and claimed in said Letters Patent No. 527,242, but that the said pretended or alleged new and useful method of making expanded sheet metal and all material and subtsantial parts and steps thereof, were, long prior to the date of the supposed invention thereof by the said John F. Golding, patented to other persons and described and shown in numerous Letters Patent of the United States, Great Britain, France, Germany, Switzerland and Russia, and in numerous printed publications, and particularly in the following mentioned several Letters Patent of the United States, Great Britain, France, Germany,

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Switzerland and Russia, and in the following mentioned printed publications, to wit,

Letters Patent of the United States.

23,597 to J. W. Mauterstock, dated April 12, 1859, for Metal Lathing.

150 23,877 to W. E. Worthen, dated May 3, 1859, for Fire Proof Lathing.

24,689 to Worthen & Renwick, dated July 5, 1859, for Corrugating Sheet Metal.

65,954 to F. Schmidt, dated June 18, 1867, for Wood Planing Machine.

73,765 to J. F. Walter, Jr., dated Jan 28, 1868, for Metallic Lathing

84,881 to I. V. Holmes, dated Dec. 15, 1868, for Metallic Lathing.

94,333 to J. W. Nesmith, dated Aug. 31, 1869, for Machine for Punching Metal Screens.

131,378 to H. A. Snowden, dated Sep. 17, 1872, for Machine for Cutting Paper, Leather and Other Thin Substances.

176,511 to Carpenter, Kauffman and White, dated April 25, 1876, for Machines for Punching Metal Laths.

186,030 to J. S. Atkinson, dated Jan. 9, 1877, for Machines for Slitting Metallic Plates.

186,109 to J. G. Clark, dated Jan. 9, 1877, for Machines for Punching Metallic Lath.

187,142 to J. W. Hoyt, dated Feb. 6, 1877, for Metallic Lathing.

7,651 to J. W. Kensett, re-issued May 1, 1877, for Metallic Lathing.

202,956 to W. M. Parker, dated April 30, 1878, for Metal Lath Machine.

214,038 to J. V. Hennessey, dated April 8, 1879, for Metallic Lath.

244,845 to J. W. Bowles, dated July 26, 1881, for Rotary Cutter.

283,488 to J. W. Hyatt, dated Aug. 31, 1883, for Machine for Perforating Sheet Metal.

297,382 to J. F. Golding, dated April 22, 1884, for Slashed Metallic Screening

312,864 to I. Kinney, dated Feb. 24, 1885, for Metallic Fencing.

320,240 to J. F. Golding, dated June 16, 1885, for Process of Making Metallic Screening Material.

320,241 to Golding & Durkee, dated June 16, 1885, for Machine Making Slashed Metallic Screening.

320,242 to Golding and Durkee, dated June 16, 1885, for Process of Making Slashed Metallic Screening.

151 330,337 to A. D. Laws, dated Nov. 10, 1885, for Machine for Punching Metallic Strap Bands.

352,826 to J. W. Kensett, dated Nov. 16, 1886, for Metallic Lathing and Foundation Therefor.

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366,328 to D. P. N. Little, dated July 12, 1877, for Metallic Lathing.

381,320 Golding & Durkee, dated April 17, 1888, for Machine for Slashing and Expanding Flat Sheet Metal to Form Meshes.

381,231 to J. F. Golding, dated April 17, 1888, for Machine for Making Slashed Metallic Screening.

385,405 to J. R. Branden, dated July 3, 1888, for Machine for Slitting Metallic Sheets for Metallic Lathing.

385,663 to A. Ekstrom, dated July 3, 1888, for Machine for Making Metallic Lathing.

390,441 to J. R. Branden, dated Oct. 2, 1888, for Machine for Opening out Metallic Lathing.

402,240 to G. Hayes, dated April 30, 1889, for Machine for Making Metallic Lathing.

408,599 to I. S. Elkins, dated Aug. 6, 1889, for Metallic Lathing.

416,165 to G. Hayes, dated Dec. 3, 1889, for Metallic Lathing.

424,445 to J. Adair, dated April 1, 1890, for Metallic Matting.

427,989 to G. Hayes, dated May 13, 1890, for Metallic Lathing.

429,095 to W. Livingstone, dated May 27, 1890, for Method of Making Metallic Fences.

432,141 to C. Kinney, dated July 15, 1890, for Metallic Lathing.

442,732 to R. D. Nuttall, dated Dec. 16, 1890, for Candy Machine.

447,085 to L. L. Sagendorph, dated Feb. 24, 1891, for Metallic Lathing.

459,625 to W. W. Bostwick, dated Sep. 15, 1891, for Metal Lathing.

459,726 to H. A. Stone, dated Sept. 15, 1891, for Machine for Producing Metal Lathing.

459,727 to H. A. Stone, dated Sept. 15, 1891, for Machine for Producing Metal Lathing.

460,542 to F. Stephanie, dated Sept. 28, 1891, for Metallic Lathing.

152 460,850 to C. H. Curtis, dated Oct. 6, 1891, for Metal Lathing.

462,333 to C. B. Sill, dated Nov. 3, 1891, for Metal Lathing.

475,700 to G. A. Ohl, dated May 24, 1892, for Machine for Making Metal Lathing.

514,313 to W. Eckstein, dated Feb. 6, 1894, for Metallic Lathing.

537,242 to J. F. Golding, dated Oct. 9, 1894, for Method of Making Expanded Sheet Metal.

544,180 to T. T. Lewis, dated Aug. 6, 1895, for Machine for Making Battery-Plates.

547,952 to G. Hayes, dated Oct. 15, 1895, for Machine for Manufacture of Sheet Metal Lathing.

Letters Patent of Great Britain.

1,488, of 1855,
6,977, of 1844,
16,033, of 1844,
11,332, of 1885 and
14,146, of 1894.

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Letters Patent of France.

No. 9,744, dated July 23, 1870, 2d Ser. Vol. 115, c. 5, 4 p. 13, pl. 4, M. Deny.

Letters Patent of Germany.

No. 84,345.

Letters Patent of Switzerland.

No. 8,954, dated August 27, 1894.

Letters Patent of Russia.

No. 10839, dated October 9, 1888.

Printed Publications.

153 The printed copies of the specifications and drawings of the aforesaid several Letters Patent of the United States, published by the Patent Office of the United States in the city of Washington in the District of Columbia, on the dates corresponding to the dates of the said several Letters Patent of the United States, respectively.

The printed copies of the specifications and drawings of the aforesaid Letters Patent of Great Britain, printed and published in the City of London, England, on the dates corresponding to the dates when said several Letters Patent of Great Britain were granted respectively.

The printed copies of the specifications and drawings of the aforesaid Letters Patent of Germany, printed and published in the City of Berlin, Germany, on the dates corresponding to the date of the said Letters Patent of Germany.

The printed copies of the specifications and drawings of the aforesaid Letters Patent of France, printed and published in the City of Paris, France, on the date corresponding to the date when the said Letters Patent of France were granted.

The printed copies of the specifications and drawings of the aforesaid Letters Patent of Switzerland, printed and published in the City of Berne, Switzerland, on the date corresponding to the date of the said Letters Patent of Switzerland.

The printed copies of the specification and drawing of the aforesaid Letters Patent of Russia, printed and published in the City of St. Petersburg, Russia, on the date corresponding to the date when the said Letters Patent of Russia were granted.

And also in numerous other Letters Patent of the United States and of Great Britain, France, Germany, Switzerland and Russia, and of other foreign countries and in numerous other printed publications of which the numbers and dates and the names of the patentees of the said Letters Patent of the United States and foreign countries, and the dates, titles and names of the other printed pub-

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lications are unknown to the respondents at this time, but
154 which, when known, the respondents pray leave by proper amendments to insert in their answer.

XII. The respondents further aver that the said John F. Golding was not the original and first inventor or discoverer of any material or substantial part of the method patented in said Letters Patent No. 527,242, in suit, and respondents further aver that long prior to the alleged invention or discovery thereof by the said John F. Golding, the method patented in said Letters Patent No. 527,242, was known to and practiced by the following persons of and at the following places, to wit:

J. W. Mauterstock, of New York, N. Y., at said New York and elsewhere.

W. E. Worthen, of New York, N. Y., at said New York and elsewhere.

Worthen & Renwick, of New York, N. Y., at said New York and elsewhere.

F. Schmidt, of Cincinnati, Ohio, at said Cincinnati and elsewhere.

J. F. Walter, Jr., of New York, N. Y., at said New York and elsewhere.

I. V. Holmes, of New York, N. Y, at said New York and elsewhere

J. W. Nesmith, of Black Hawk, Col., at said Black Hawk and elsewhere.

H. A. Snowden, of Brooklyn, N. Y., at said Brooklyn and elsewhere.

Carpenter, Kauffman and White, of Beardstown, Ill., at said Beardstown and elsewhere.

J. S. Atkinson, of Pittsburg, Pa., at said Pittsburg and elsewhere.

J. N. G. Clark, of Springfield, Mass., at said Springfield and elsewhere.

J. W. Hoyt, of Springfield, Mass., at said Springfield and elsewhere.

J. W. Kensett, of Troy, N. Y., at said Troy and elsewhere.

W. M. Parker, of Rushville, Ill., at said Rushville and elsewhere.

J. V. Hennessey, of Albany, N. Y., at said Albany and elsewhere.

155 J. W. Bowles, of Washington, D. C., at said Washington and elsewhere.

J. W. Hyatt, of Newark, N. J., at said Newark and elsewhere.

J. F. Golding, of Chicago, Ill., at said Chicago and elsewhere.

I. Kinney, of Windsor, Ontario, Canada, at said Windsor and elsewhere.

J. F. Golding, of Chicago, Ill., at said Chicago and elsewhere.

Golding & Durkee, of Chicago, Ill., at said Chicago and elsewhere.

Golding & Durkee, of Chicago, Ill., at said Chicago and elsewhere.

A. D. Laws, of Bridgeport, Conn., at said Bridgeport and elsewhere.

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J. W. Kensett, of Newport, R. I., at said Newport and else-
here.
D. P. N. Little, of San Francisco, Cal., at said San Francisco and
lsewhere.
Golding & Durkee, of Chicago, Ill., at said Chicago and else-
here.
J. F. Golding, of Chicago, Ill., at said Chicago and elsewhere.
J. R. Branden, of Detroit, Mich., at said Detroit and elsewhere.
A. Ekstrom, of Detroit, Mich., at said Detroit and elsewhere.
J. R. Branden, of Detroit, Mich., at said Detroit and elsewhere.
G. Hayes, of New York, N. Y., at said New York and elsewhere.
I. S. Elkins, of New York, N. Y., at said New York and else-
here.
G. Hayes, of New York, N. Y., at said New York and elsewhere.
J. Adair, of New York, N. Y., at said New York and elsewhere.
G. Hayes, of New York, N. Y., at said New York and elsewhere.
W. Livingston, of Jersey City, N. J., at said Jersey City and else-
here.
C. Kinney, of Windsor, Ontario, Canada, at said Windsor and elsewhere.
156 R. D. Nuttall, of Allegheny, Pa., at said Allegheny and elsewhere.
L. L. Sagendorph, of Philadelphia, Pa., at said Philadelphia and
lsewhere.
W. W. Bostwick, of New York, N. Y., at said New York and else-
here.
H. A. Stone, of New York, N. Y., at said New York and else-
where.
F. Stephanie, of New York, N. Y., at said New York and else-
where.
C. H. Curtis, of Niles, Ohio, at said Niles and elsewhere.
C. B. Sill, of Youngstown, Ohio, at said Youngstown and else-
where.
G. A. Ohl, of Newark, N. J., at said Newark and elsewhere.
W. Eckstein, of London, Eng., at said London and elsewhere.
J. F. Golding, of Chicago, Ill., at said Chicago and elsewhere.
T. T. Lewis, of Philadelphia, Pa., at said Philadelphia and else-
where.
G. Hayes, of New York, N. Y., at said New York and elsewhere.

XIII. And further answering, respondents aver that they are engaged in investigation as to prior knowledge and use of the alleged invention described in said Letters Patent set forth in said Bill, and expect to obtain such further information as may render it necessary to protect their rights in the premises, and secure the ends of justice, to amend this answer by appending the same the names of other persons or places by whom and at which such prior knowledge and use were had, and a reference to Letters Patent and Publication in which said alleged invention was described.

XIV. The respondents, further answering, say that they are advised by counsel learned in law, and believe and aver that, in view

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of the state of the art in the making of expanded sheet metal
157 analogous arts and devices prior to the date of the supposed
invention by the said John F. Golding, of the method of
making expanded sheet metal shown and described and claimed in said Letters Patent No. 527,242, and particularly in view of the prior art of the making of expanded sheet metal and analogous arts and structures as exhibited in and by the several Letters Patent of the United States, Great Britain, France, Germany, Switzerland and Russia, and the printed publications hereinbefore recited and mentioned, and as exhibited in many other prior Letters Patent and printed publications to be presented to the Court at the hearing of this cause, and as will be exhibited by the evidence to be taken on behalf of the respondents herein, it required no invention to produce said patented or alleged improvements in the method of making expanded sheet metal, but that the same and all material and substantial parts and steps thereof were the product of mere mechanical skill and involved no new step, but the mere carrying out of well known steps and the operation of well known machines, producing no new result or function and that the same was not a patented improvement or discovery within the meaning of the law, but, on the contrary, was the old and well known machines and devices for performing no new result or function and was therefore not a patentable method within the meaning of the law, and that said Letters Patent No. 527,242, is therefore null and void.

XV. Further these respondents aver on information and belief, that in view of the state of the art that the date of the assumed invention of said John F. Golding, in view of the expressed limitations and restrictions of the specification and claim of said patent and in view of the restrictions and disclaimers imposed upon said claim, and the matters and things cancelled therefrom by the patentee and inserted therein during the prosecution of the appli-
cation for Letters Patent in the Patent Office for the purpose
158 of obtaining said Letters Patent, said claims cannot be con-
strued to cover or include anything ever made, sold or used
by these respondents.

All of which foregoing statements and defences these respondents are ready and willing to aver, maintain and prove at this Honorable Court shall direct; and without admitting as true any of the matters charged and alleged in said Bill of Complaint not herein well and sufficiently answered, confessed, traversed and avoided or denied, prays to be hence dismissed with its cost and charges in its behalf most wrongfully sustained.

EUGENE S. BRADFORD,
JOS. C. MILLICHAMP,
NICHOLAS J. SCHMUCKER, Jr.,
N. J. SCHMUCKER.

E. HAYWARD FAIRBANKS,
Solicitor for Respondents.

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TE OF PENNSYLVANIA, *County of Philadelphia, ss:*

n this first day of August, A. D., 1903, personally appeared be- me Eugene S. Bradford, who being duly sworn, deposes and s that he is one of the respondents herein, and that he has read foregoing answer and knows the contents thereof; that the same rue of his own knowledge, except as to the matters which are ein admitted or stated to be based on information and belief, and o those matters he believes it to be true.

EUGENE S. BRADFORD.

ubscribed and sworn to this first day of August, A. D., 1903.

JOHN A. WIEDERSHEIM,
Notary, Etc.

Circuit Court of the United States, Eastern District of Pennsylvania. In Equity.

No. 14. April Sessions, 1903.

E EXPANDED METAL COMPANY, and HENRY CHESS, WALTER CHESS, and HARVEY B. CHESS, Co-partners, Trading as Chess Brothers, Complainants,

vs.

GENE S. BRADFORD, JOSEPH C. MILLICHAMP, NICHOLAS J. SCHMUCKER, JR., and NICHOLAS J. SCHMUCKER, Respondents.

oofs for final hearing, taken on behalf of defendants pursuant to the 67th rule of equity and its amendments, at 1232 Chestnut street, Philadelphia, before Clara F. McVay, notary public, as special examiner, by agreement of counsel, commencing on Tuesday, August 2, 1904, at 11.30 a. m.

Present: Ernest Howard Hunter, for complainants; E. Hay- rd Fairbanks, for defendants.

NICHOLAS J. SCHMUCKER, called as a witness on behalf of de- ndants, and having been duly sworn by the Examiner, testifies follows:

Direct examination by Mr. FAIRBANKS:

Q. 1. State your name, age, residence and occupation?

A. Nicholas J. Schmucker, Jr., age 33, Philadelphia, Pa., salesman.

Q. 2. Are you the Nicholas J. Schmucker, Jr., named as a de- ndant herein?

A. I am.

Q. 3. Please state how many machines manufacturing expanded etal you, or any of the defendants herein have ever had in use?

A. One.

Q. 4. Did this one machine ever work satisfactorily, or not?

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(Objected to as incompetent.)

A. No.

Q. 5. Please state what amount of money you have spent in endeavoring to get this machine to work satisfactorily or practically?

(Objected to as incompetent, irrelevant and immaterial.)

A. Between eleven and twelve thousand dollars.

Q. 6. State whether or not you ever actually sold any of the products of this machine, and if so, what was the date when such sale was made?

(Objected to as irrelevant and immaterial.)

A. Yes to the first part, on August 28, 1903.

Q. 7. You mean the first sale of any of the product of this machine was made on August 28th, 1903, is that correct?

(Same objection.)

A. It is.

Q. 8. Please give some idea of the amount of profits you have made from the use of this machine complained of, or if you have made no profits will you please so state?

161 (Objected to as incompetent, irrelevant and immaterial.)

A. I never made any profits. By this I mean no profits were made.

Q. 9. If the use of this machine complained of has resulted in any loss to the defendants, financially, will you please so state, and give an approximate idea of the amount of such loss?

(Same objection.)

A. I should say over ten thousand dollars.

Q. 10. State whether or not defendants' machine herein complained of was constructed under a patent or not?

(Objected to as incompetent.)

A. It was.

Q. 11. Are you familiar in a general way with the reading of mechanical drawings?

A. No, sir.

Q. 12. You have, however, enough general familiarity as to the drawings of the Bradford patent, No. 664,379, patented December 25, 1900, to say whether or not the defendants' machine conforms substantially to these patent drawings, have you not?

(Objected to as incompetent.)

A. Yes, sir.

Q. 13. Prior to embarking in the business of manufacturing expanded sheet metal, did you obtain the expert opinion of competent counsel, as to whether or not the defendants' Bradford machine infringed any prior patent or patents, and did you undertake this business in good faith as a result of a report made to you by your counsel?

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(Objected to as incompetent, irrelevant and immaterial.)

162 A. Yes.

Q. 14. Did the defendants' machine complained of constructed under the Bradford patent No. 664,379, ever make any expanded metal or lathing which was of the same length as that of the original sheet or blank?

(Objected to as incompetent.)

A. It never did.

Q. 15. Referring once more to your answer to Q. 13, please state in a general way what was the opinion of your counsel as to whether or not your defendants' Bradford machine infringed, any prior patent or patents?

(Objected to as incompetent, irrelevant and immaterial.)

A. That it did not infringe any prior patent.

Q. 16. It appears from the court records herein, that this suit was instituted on or about the 30th day of April, 1903, since the writ herein is dated April 30, 1903, now state whether or not at or prior to April 30, 1903, you or any of the defendants herein had a machine of any character in actual practical use or capable of commercially producing this so-called expanded metal?

(Objected to on the ground that, if the answer can be material or relevant, it will be inconsistent with the stipulation of counsel, and if not inconsistent with the said stipulation, it will be irrelevant and immaterial. The question is further objected to as incompetent.)

(Mr. Fairbanks replies that it has nowhere been stipulated that the defendants had in use, prior to the filing of the bill herein, a machine capable of producing a practical and commercial product.)

(Mr. Hunter refers to the stipulation on page 11 of complainants' *prima facie* proofs, and as he now understands from the statement of defendants' counsel that the question is not intended 163 to modify or affect that stipulation, he simply objects to the question as incompetent, irrelevant and immaterial.)

A. We did not.

Q. 17. When, if ever, did the defendant's Bradford machine, herein complained of, operate with any degree of satisfaction?

(Same objection.)

A. It never operated with any degree of satisfaction, we possibly could get one sheet out of a dozen which would really be marketable.

Q. 18. What is the first date when, if ever, you succeeded in making a sale of any expanded metal sheets, the product of the machine herein complained of?

(Same objection.)

A. We sold on August 28, 1903, 150 yards, square yards, which possibly took us three or four days to make.

Q. 19. Then, in view of your last answer, it was not until the

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month of August, 1903, some three or four months subsequent to the filing of the bill herein, that the machine was capable at all of producing a commercial and marketable sheet of expanded metal, please state the facts as to this?

(Same objection.)

A. It was sometime after the 20th of August before we were able to produce lath that we could ship.

Q. 20. Was the defendants' Bradford machine capable of producing a finished expanded sheet metal plate of the same length as that of the original blank sheet or plate, and did it ever, to your knowledge, produce a plate of this character, please state the facts as to this?

(Same objection.)

A. The finished sheet was always longer than the blank.

Q. 21. Mr. Golding has stated in his answer to D. Q.
164 19 that the defendants' Bradford machine, on the occasion
he says he saw it running, to wit, April 14, 1903, produced an expanded metal sheet of fourteen inches in width, was the defendants' machine capable of producing a sheet of this width at this date?

(Objected to as incompetent.)

A. It was not.

Q. 22. The defendants' Bradford machine was up to and until the month of August, 1903, incapable of producing any salable or marketable expanded metal sheets and it furthermore never at any time, so far as you know, produced any such sheets of the same length as the original blank, please state the facts as to this?

(Objected to as incompetent.)

A. Never. Prior to August 20th the machine never produced marketable sheets, nor never produced a sheet the same length as the blank.

Direct examination closed.

Cross-examination by Mr. Hunter:

X Q. 23. You say that you are a salesman, what are you engaged in selling?

A. Groceries.

X Q. 24. And for how long have you been a grocery salesman?

A. About nine years.

X Q. 25. Have you ever had any training in mechanics?

A. Never.

X Q. 26. You do not mean to deny that prior to April 30, 1903, the Bradford machine was being operated in the making of expanded metal lathing, do you?

A. I do, other than in an experimental way.

165 X Q. 27. Whether it was experimental or not, you admit
that prior to April 30, 1903, the Bradford machine was being operated to make expanded metal lathing?

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A. It was not.

X Q. 28. What were you doing with the machine prior to April 30, 1903?

A. Trying to make it produce steel lath.

X Q. 29. And you were operating it upon sheets of metal to cut and expand them?

A. Just experimenting with it?

X Q. 30. You will please answer my question, yes or no, without reference to whether you considered the work experimental or not? Question repeated.

(Mr. Fairbanks objects to this unnecessary reiteration as the witness has already several times stated the only use made of the machine at the period stated was solely an experimental one.)

A. It was necessary for us to have sheet steel to prove whether our machine was right or not. Prior to August the 20th it was not.

X Q. 31. Question repeated, I must ask you to answer the question, yes or no. Did you use your machine prior to April 30, 1903, on sheets of steel to cut and expand them in an endeavor to make expanded metal? I do not care whether you considered what you were doing experimental or not.

(Mr. Fairbanks states on the record to the witness, that he is not obliged to answer any question in the language suggested by complainants' counsel, but that it is his right and privilege to qualify his answers if he so desires.)

A. I would say in answer to the question that the machine was not practically successful, but I would answer yes to the question. We were certainly trying to make it.

X Q. 32. Who operated this machine prior to August,
166 1903?

A. Between February and August I did.

X Q. 33. Exclusively?

A. I had a helper.

X Q. 34. Who instructed you how to operate it?

(Objected to as immaterial, and not cross-examination.)

A. I gained what little knowledge I had by seeing Bradford work on it.

X Q. 35. Mr. Bradford operated it, too, did he not?

A. Yes.

X Q. 36. Who operated the machine in August, 1903, when you succeeded in making a commercially marketable product?

A. Mr. Booss, Charles J. Booss.

X Q. 37. How long were the strips of sheet metal which you used when you were operating the machine?

A. Ninety-seven inches.

X Q. 38. And how long were the sheets after they had been cut and expanded?

A. Ninety-seven and one-half inches.

X Q. 39. You always measured, did you?

A. Not every sheet.

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X Q. 40. But when you did measure, you invariably found elongation of one-half inch?

A. We always found the sheets were from ⅜ to ⅝ of an in longer.

X Q. 41. Why did you measure them?

(Objected to as immaterial and irrelevant.)

A. To see as to whether we were lengthening the product as length of lath had to be of a length to reach to a given studding

X Q. 42. Why did you use sheets 97 inches in length?

(Same objection as last made.)

A. In order to trim off any rough edges, and thus be within requirement of 96 inches.

167 X Q. 43. You say this machine in April, 1903, was inc able of producing a strip of lathing of a width of 14 inch why was that?

A. The machine wasn't long enough to produce it.

X Q. 44. How wide a strip could it produce?

A. Not over 11 and three-quarters.

X Q. 45. You say the first commercial product was produced that machine in August, 1903, to whom was that lot sold?

A. C. C. Shiber, Wilkesbarre, Pa., 150 yards.

X Q. 46. After August, 1903, was the machine used in the p duction of commercial lathing?

A. It was.

X Q. 47. That machine was taken away from Philadelphia, it not?

(Question objected to as not germane to the direct depositi and as not cross-examination at all.)

A. Yes, it was.

X Q. 48. Do you know where that machine is now?

(Same objection.)

A. I do not.

X Q. 49. Is it still owned by you and your associates, the defe ants in this suit, or any of them?

(Same objection.)

A. Yes.

X Q. 50. Have you no knowledge of where that machine is the present time?

(Same objection.)

A. Not any personal knowledge.

X Q. 51. But you have been informed and believe you know, if so, please state?

(Question objected to as not cross-examination and as calling hearsay and obviously incompetent.)

168 A. I believe the machine is in Canton, Ohio.

X Q. 52. In what establishment?

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(Same objection.)

A. I believe in the Berger Manufacturing Company.

X Q. 53. To what do you attribute this failure of this machine to produce commercial expanded metal lathing prior to August, 1903?

A. To not being able to get metal to operate in the machine.

X Q. 54. Did you not have difficulty with the metal you were then using, owing to the fact that it tended to buckle or close up the previously formed meshes when the next line of meshes was being formed?

(Objected to as not cross-examination at all.)

A. Not until after the sheet had gotten well into the machine.

X Q. 55. But you met with that difficulty, and it would render the sheet unsalable?

(Same objection.)

A. We found that the sheets broke, which would have more effect on the production than the buckling.

X Q. 56. Do you mean that the strands forming the meshes broke apart?

(Same objection.)

A. Yes.

Redirect examination by Mr. Fairbanks:

R. D. Q. 57. During the experimental use of this machine, up to August, 1903, did you not have trouble in getting it to operate (aside from the fact that the original blanks or sheets were not satisfactory owing to mechanical defects of the machine), such as the cutters not operating satisfactorily, and other similar troubles?

(Objected to as irrelevant and immaterial.)

169 A. We did. We were compelled to have a new set of cutters made and also change quite a few of the gears, as we found the tension of the shaft was so great it was continually breaking.

R. D. Q. 58. The machine was continually being altered and dismantled and many hundreds of dollars were being spent on it from the early part of 1903 up to the fall of that year, in the endeavor to get it to operate satisfactory, and even as late as the fall or winter of 1903 it was not satisfactory, please state the facts as to this?

(Same objection.)

A. Up to the time the machine was dismantled, which was sometime in February, 1904, it was continually breaking, which caused us quite a little annoyance and expense.

R. D. Q. 59. So that it is a fact that it was on account of the inherent mechanical defects of the defendants' machine that it failed to operate satisfactorily, rather than on account of particularly the metal of which the sheet to be expanded was made, is that correct?

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(Same objection.)

A. A great difficulty was to get the machine to operate with su material as we could get.

N. J. SCHMUCKER, JR.

170 Circuit Court of the United States, Eastern District of Pen sylvania. In Equity.

No. 14. April Session, 1903.

THE EXPANDED METAL COMPANY and HENRY CHESS, WALT CHESS, and HARVEY B. CHESS, Co-partners, Trading as Ch Brothers, Complainants,

vs.

EUGENE S. BRADFORD, JOSEPH C. MILLICHAMP, NICHOLAS SCHMUCKER, JR., and NICHOLAS J. SCHMUCKER, Respondents.

Proofs for final hearing, taken on behalf of defendants pursuant the 67th rule of equity and its amendments, at 1232 Chestn street, Philadelphia, before John A. Widersheim, notary publ acting as special examiner by agreement of counsel, commenci on Monday, August 8, 1904, at 11 a. m.

Present: Ernest Howard Hunter, for Complainants; E. Haywa Fairbanks and William Steell Jackson, for Defendants.

EUGENE S. BRADFORD, called as a witness on behalf of Defendan having been duly sworn by the Examiner, testifies as follows:

Direct examination by Mr. JACKSON:

Q. 1. State your name, age, residence and occupation?

171 A. Eugene S. Bradford, age 52, I am Superintendent Machinery to the Berger Manufacturing Company, Cant Ohio. I reside at 322 North Cleveland Avenue, Canton, Ohio.

Q. 2. Are you the Eugene S. Bradford named as one of the D fendants in this suit?

A. I am.

Q. 3. I call your attention to United States Patent No. 664,37 granted December 25, 1900, to E. S. Bradford. State your relatio ship, if any, to this E. S. Bradford.

A. I am the one mentioned as patentee.

Q. 4. State the facts in connection with the origin of the structu shown in this patent and any further development or working the construction following the application for the patent?

A. I was familiar with expanded metal from its conception, a owing to repeated solicitations on the part of my brother, Osc Bradford, I had endeavored for some time, previous to the applic tion for patent, to design a machine that would produce more e panded metal lath than previous machines had been able to d After considerable thought and study I designed and made dra

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ings for the present rotary machine indicated in the patent mentioned. The necessity for such a machine was because of the fact that the machines in use did not produce lath enough in a given time. The patent was applied for and obtained. After the allowance of the patent I immediately wrote my brother, Oscar Bradford, that the patent had been obtained and we entered into correspondence relative to its use, I having proffered it to his Company. The outcome of the negotiations was that I gave him an option dated 11th day of June, 1900, in which he was given the sole right to build and operate this machine for one year from late. At the expiration of the year I extended the option for an extra six months.

172 At the time that I gave this option to my brother, Oscar Bradford, and during the life of it he was president of the Expanded Metal Company, a party complainant herein, and I presume that he obtained this option for the use and benefit of the Expanded Metal Company. He did not see fit to exercise this option, and I proceeded to interest capital for the purpose of building a machine and using the same, which I succeeded in doing. We commenced to build the machine in June, 1902. It was completed at the manufactory about the 1st of November, 1902, and set up at the corner of Water and Mifflin Streets, this city. After setting up the machine, we found that there were some considerable changes to be made which we proceeded to make, and from the time mentioned until about the 1st of April, 1903, I had charge of the machine. After that time and until the middle of November, 1903, I had no connection whatever with the enterprise. During the time I had charge of the machine, as above stated, from November, 1902, until April, 1903, we were unable to produce any commercial lath, the use of the machine being entirely experimental. I am given to understand that during the period that I was not connected with the enterprise, from April, 1903, to November, 1903, they succeeded in producing a very small quantity of lath, but from what I could learn the machine at that time was not a commerical success. About the middle of November, under agreement with parties interested, I assumed charge again of the machine for the purpose of demonstrating its practicability. I run it one day and succeeded in producing a comparatively good quality of lath, but not in a manner that I would call a successful production of lath.

Q. 5. State the objections which you found to the machines for making expanded metal which were in existence prior to your invention?

A. All of the machines previous to mine had a reciprocating movement, which is necessarily slow and the cutters used in

173 connection with the machines are expensive to make and hard to keep in repair. The machine of that character has a continuous jar on account of the cutting of the metal which has a tendency to loosen the different parts and thereby get the cutters out of line, which necessitates resetting of the cutters and consequently a loss of time on that account. A reciprocating machine is clumsy and hard to operate.

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Q. 6. Mr. John F. Golding has testified in this case. Please state whether or not you are acquainted with him and what you know of his connection with expanded metal work?

A. I have known John F. Golding since 1883. About that time Mr. Golding interested my brother, Oscar Bradford, who advanced or arranged to secure money for the purpose of manufacturing expanded metal. After various unsuccessful attempts they finally succeeded in building a machine that would produce the metal.

Q. 7. Did you or did you not have any further negotiations with the Complainant Company, the Expanded Metal Company, or any of its allied sub-companies with the object of interesting them in the construction of your patent?

A. I had considerable correspondence with Mr. J. F. Golding, the patentee, under whose patent suit was brought, and also Mr. Kearns, of Boston, Manager of the sub-company for that district.

Q. 8. Were these other efforts to interest the complainant company before or after the institution of suit herein and what was the result of these efforts?

A. There was nothing done. These efforts were made before the suit was brought.

Q. 9. How did the length of the finished lath made upon the defendants' Bradford's Machine compare with the length of the metal sheet from which the lath was made?

A. It was longer.

174 Q. 10. Was it in all cases longer?

A. Yes.

Q. 11. Why was this so?

A. After the operation of the cutter on the metal sheet the strand becomes hardened to a certain extent and such being the case, it has a tendency to resume its original position and in so doing it straightens out to a certain extent, thereby lengthening the sheet to a certain extent.

Q. 12. In the complainants' patent, the following functional statement appears in the latter part of the claim:

> "thus producing the finished expanded sheet metal of the same length as that of the original sheet or plate,"

please state the facts as to the capability of the machine shown in complainants' patent for performing this function.

A. I do not think it is capable of so doing.

Q. 13. I direct your attention to the drawing of patent No. 381,230, granted April 17, 1888, issued to J. F. Golding and G. B. Durkee, for a machine for slashing and expanding flat sheet metal to form meshes, calling attention particularly to Figure 11 thereof, and ask you to state whether or not you find shown therein a machine capable of simultaneously slitting and bending portions of a plate or sheet of metal.

A. I have seen the machine mentioned in operation and it does perform the operation stated.

Q. 14. Please state whether or not the machine of which you

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testified in answer to Q. 13 also stretched or enlongated the bars connecting the slit portions and the body of the sheet or plate?

A. It did to a certain extent.

Q. 15. Did or did not the machine of which you have just testified similarly slit and bend in places alternate to the first mentioned portions?

175 A. It does and it did.

Q. 16. I again call your attention to the Golding & Durkee Patent, to which reference was made in Q. 13, and ask you to examine the same and state whether or not the machine of which you testified in A. 13 agreed so far as you are able to state, in all particulars with the construction shown in said patent?

A. It did.

Q. 17. Who was operating or controlled the machine concerning which you have just testified, like that shown in the Golding & Durkee Patent at the time that you saw it?

A. The Northwestern Expanded Metal Company, of Chicago, a sub-company licensed by the Expanded Metal Company, of Chicago.

Q. 18. Is the machine constructed in accordance with the Golding & Durkee Patent above, No. 381,230, or is it not an operative machine?

A. It is.

Q. 19. Was it or was it not used during a considerable period and is it, to the best of your knowledge and belief, now in use?

A. I have seen it in operation and have known it to be in operation for a number of years and believe that it is still in operation.

Adjourned until 2 o'clock.

Q. 20. In the case of the machine of your patent hereinbefore mentioned, what are the advantages, if any, of employing rotary cutters?

A. Because by using the principle of a rotary cutter a continuous feed is obtained, in other words, there is no stoppage or alternating movement such as you have to have by the use of a reciprocating movement and which is a serious objection to reciprocating type of machine. By the use of a rotary cutter, greater accuracy is obtained in the width of the strand, greater cheapness in the manu-
176 facture of the cutters, also less difficulty in setting them. The adjustment of the cutters is simplified.

Q. 21. Will you compare in a general way the rapidity of operation of your machine with the rapidity of operation of the machines of these two Golding patents?

A. About four yards of lath from my machine to one yard of lath from the Golding machines.

Q. 22. Is there any reason why speed is particularly desirable in the manufacture of lath?

A. Yes, it is desirable and it has been the object for some time of those interested in the manufacture of the metal lath to produce it at a figure so as to compete with wood lath, and that was my object in designing this machine to obtain a production that would enable the competitive price to be offered. Prior to my invention and the

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construction of my machine the cost of metal lath was nearly double that of wood lath.

Q. 23. Mr. Golding has stated in his testimony that in the course of conversation with you, you stated that the machine of your patent produced this expanded metal sheet of exactly the same length as the original blank. State the accuracy or inaccuracy of Mr. Golding's statement?

A. I never made such statement, either to Mr. Golding or anybody else.

Q. 24. In question 21, the Golding Patents referred to were Golding & Durkee's patent, No. 381,230, and the patent in suit. Did you so understand this question?

A. Yes.

Q. 25. The suit in this case was instituted on or about April 30, 1903. What was the condition of your machine at this time?

A. According to the best information that I could obtain at that time the machine was not in operation nor was it capable of producing lath. This was certainly true at the time I ceased
177 to have charge of the machine at the beginning of April, 1903.

Q. 26. Was your machine upon the 30th of April, 1903, or had it before this date, according to your knowledge, information and belief, been capable of producing expanded metal sheets of marketable character?

A. Well, to my own knowledge and belief it was not and had not been capable of producing commercial lath.

Q. 27. In what respect was your machine inoperative and incomplete at this time?

A. Because the cutters were not suitable to the work.

Q. 28. When did you finally get your machine into an operative condition?

A. About the middle of March, 1904, which was the first time that it was capable of producing metal lath.

Q. 29. Mr. Schmucker has testified that in the month of August, 1903, the machine was capable of producing a small quantity of the expanded sheets, some of which were sold to a party in Wilkesbarre. Will you please state a little more fully if the defendants' machine was actually operative in a practical sense even at that time?

A. From my information and belief, I did not think that the machine was capable of producing the metal lath commercially. While it might produce a few sheets that would be to size there would be fifteen or twenty sheets that would be spoiled. By "to size" above I mean of commercial size, that is, of dimensions large enough for practical use.

Q. 30. I show you two exhibits which the Examiner is asked to mark "Defendants' Exhibit, Bradford Blank Sheet" and "Defendants' Exhibit, Bradford's Expanded Sheet." Please look at these two exhibits and state what they are.

A. "Defendants' Exhibit, Bradford's Blank Sheet," is a sheet of metal cut ready for operating on in the machine. It is ordinarily ninety-six inches long and five and nine-sixteenths inches wide.

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"Defendants' Exhibit, Bradford's Expanded Sheet," is the
78 sheet after having been operated upon by the machine, which
shows the expansion laterally and also the extension longi-
ıdinally. I personally saw the operation performed by this (my)
ıachine upon this expanded sheet, namely, "Defendants' Exhibit,
radford's Expanded Sheet," and know of my own knowledge that
ıe length of the blank sheet from which this expanded sheet was
ıade was, before such making, exactly the same at that of "Defend-
nts' Exhibit, Bradford's Blank Sheet." It will be noted that the
ngth of the expanded portion of said "Defendants' Exhibit, Brad-
ord's Expanded Sheet," is now greater than that of the blank in the
ther exhibit and greater therefore than its own original blank,
hich can be seen also from the shorter length of that portion of its
wn original blank which was not expanded. This extension of the
xpanded part longitudinally beyond the length of the original
lank always takes place, the amount of said extension varying in
ıe case of a 96-inch blank between a quarter and five-eighths of an
ıch. I have never known an expanded sheet to be of the same or a
ıorter length than the original blank, in the product of my ma-
hine, although I have measured very many of them.

Counsel for Defendants introduce in evidence the two exhibits
bove mentioned, namely, "Defendants' Exhibit, Bradford's Blank
heet," and "Defendants' Exhibit, Bradford's Expanded Sheet."

Adjournment until Tuesday, August 9th, at 10 A. M.

PHILADELPHIA, *August* 9, 1904.

Met pursuant to adjournment at 2.30 P. M.

The right of objection having been reserved by agreement of
ounsel, Complainants' counsel now enters objection to Questions
3 to 19 inclusive as incompetent, irrelevant and immaterial, and
because the Golding & Durkee Patent, No. 381,230, referred
79 to, is not set up or referred to in the answer, and Complain-
ants' counsel further pleading surprise, reserves the right of
ross-examination or further cross-examination with reference
ıereto until he has had the opportunity to examine the said Letters
atent and until Defendants have corrected the deficiency in their
leadings with reference thereto.

Counsel for Defendants states that the Golding & Durkee Patent,
ı which reference has been made, was intended to have been cor-
ectly designated in the answer and that as appears from the copy of
ıe answer such patent was cited in the answer accurately in all par-
culars except for an error in the number which was given as
81,320, instead of 381,230, as it should have been cited.

Counsel for Defendants offers in evidence a copy of the patent in
uestion to Golding & Durkee, No. 381,230, for Machine for Slash-
ıg and Expanding Flat Sheet Metal to Form Meshes, the patent
eing dated April 17, 1888, and requests that the Notary mark said
xhibit "Golding & Durkee Patent of 1888."

Complainants' counsel suggests that copies must be identified by
ıeir numbers and dates. The patent, 381,320, dated April 17,
888, referred to in the answer, is a patent granted to one Michael

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J. Baumbach for Rolls for Making Barbed Wire, referring to cutting devices or cutting teeth on strips or strands of metal, and therefore relating to this art. Complainants' counsel supposed that this was the patent referred to in the Defendants' answer and having had no notice with reference to the patent 381,230 of the same date as the Baumbach patent, insists on his objection to the offer of a copy of the said patent in evidence as incompetent, irrelevant and immaterial under the pleading.

Counsel for Defendants, while regretting the clerical error in the
number of the patent as cited in the pleading, calls attention
180 to the entire disagreement of all the other data given in re-
gard to the patent except the number and date of issue with
the Baumbach patent and states that this disagreement should have placed counsel for complainants upon inquiry, the slightest amount of which inquiry would have developed the error as it exists, as the Golding & Durkee Patent could have been found quite readily by reference to the index and was located within the same week's issue and therefore within the same volume as the patent No. 381,320.

Complainants' counsel suggests it is not sufficient to put a party upon inquiry by suggestion that a pleader has made a mistake but that accuracy of pleading requires that citations should be correctly made. As a matter of fact, Complainants' counsel has had no information or knowledge with regard to the patent 381,230 until the same was presented in the taking of this deposition and submits that he must have the opportunity to properly examine and consider the same before he can be called upon to cross-examine this witness with reference to it.

Direct examination closed.

Cross-examination by Mr. HUNTER:

X Q. 1. For how long have you been practically familiar with the manufacture of expanded metal?

A. From observation, I would say, since 1884.

X Q. 2. Have you had any connection with any of the expanded metal companies?

A. Not directly.

X Q. 3. Have you indirectly, and if so, in what way?

A. I have had more or less conversations with my brother, Oscar Bradford, on this subject of expanded metal machines.

X Q. 4. How did you happen to see machines for mak-
181 ing expanded metal practically operated by the Northwestern
Expanded Metal Company?

A. From having been up there on visits to my brother and locating him there at the manufactory. I saw the machines in operation at that place.

X Q. 5. Was the factory of the Northwestern Expanded Metal Company at Chicago?

A. It was, 22d and Stewart Avenue.

X Q. 6. I understand, then, that in visiting your brother, Mr. Oscar Bradford, at the establishment of the Northwestern Expanded Metal Company at Chicago you would have seen the operation of the

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machines used by that company in the manufacture of expanded metal?

A. I have.

X Q. 7. How often?

A. I should say at least six or eight times.

X Q. 8. When?

A. The last time was in 1893, or about that time.

X Q. 9. Then you have not seen any of those machines in operation for the past eleven years?

A. Not since that time.

X Q. 10. How much time did you give to the examination of those machines?

A. Well, I should say having seen the machines so often in 1893 that I did not spend very much time examining.

X Q. 11. You said the last time you saw them was in 1893. How do you fix the time as having been 1893?

A. I had occasion to go to Chicago from St. Louis to see my brother, Oscar Bradford, and found him on the road to the Northwestern Expanded Metal Company's office and I went there with him. I walked around through the manufactory, looked at the machines in operation and found them to be the same that I had seen on previous visits.

X Q. 12. Well, how do you fix that as having been in 1893 and not in some other year?

182 A. Because it was the year of the World's Fair in Chicago.

X Q. 13. Was it on this occasion that you examined the machine that is similar to the Golding & Durkee 1888 patent?

A. Yes, sir.

X Q. 14. Were you at that time familiar with the Golding & Durkee 1888 Patent?

A. Yes, sir.

X Q. 15. How did you come to examine that patent?

A. I will qualify my previous answer by saying I was familiar with the machine built under that patent and not the patent itself.

X Q. 16. Was that the first occasion on which you examined this machine?

A. No, sir.

X Q. 17. How often had you seen it before that time?

A. I will make a statement that I had seen it at least four times. It might have been more.

X Q. 18. Was it in operation?

A. Sometimes it was and sometimes it was not.

X Q. 19. And when did you first examine the patent itself?

A. In 1899.

X Q. 20. You say that that machine when in operation stretched or elongated the bars connecting the slit portions and the body of the sheet or plate to a certain extent. What do you mean by a certain extent?

A. Through the operation of the cutters as the upper cutter slashed a cut it also bends the strand to a certain extent. The lower

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cutter receding at the same speed the strand is caught between the upper and lower cutters and is ironed out (by being ironed out I mean that it is stretched).

X Q. 21. How much was it stretched?

A. I do not know.

X Q. 22. Is this result which you have just described
183 something which you observed by actual observation from
an examination of the operation of the machine eleven years
ago or a theory which you have evolved from a recent study of the patent?

A. It is a result of my study of conditions under which expanded metal is made.

X Q. 23. You never, as a matter of fact, examined or measured any of the sheets which you saw made on that machine in 1893 or prior thereto to ascertain how much lengthening or stretching of the strands took place?

A. I never did.

X Q. 24. But you do know as a matter of fact that the finished sheet of expanded metal made on those machines was materially shorter than the blank from which it was cut?

A. Not by actual measurement.

X Q. 25. But you knew it as a matter of fact?

A. I did not.

X Q. 26. Well, from your critical examination of the patent and your knowledge of the manufacture of expanded metal, you know, as a matter of fact, that the material shortening of the plate would be the result of the operation of that machine in transforming the solid sheet into a shape of expanded metal?

A. The presumption is that the expanded metal spoken of is that made by the Golding & Durkee 1888 patent. From my own knowledge I know nothing about it, never having measured it and do not know whether it was shorter or longer. As a matter of opinion, and from having seen the machine in operation and having read the specification of the patent, I would say that it might possibly shorten the sheet.

X Q. 27. You consider it desirable, do you not, in the commercial production of expanded metal, that the sheets should not be shortened?

A. Yes, sir.

X Q. 28. You know it to be a fact that the expanded
184 metal that is now put upon the market by the Expanded
Metal Company, or at least the greater portion of it, is of a
length equal or approximately equal to the length of the blank from which the metal is cut?

A. I do not.

X Q. 29. Are you familiar with the character of expanded metal made at the present time by the Expanded Metal Company?

A. I understand that a claim is made that a metal lath is made from a blank sheet, that it remains the same length after being operated upon as it was originally.

X Q. 30. When did you first see expanded metal lathing which was not shorter than the blank from which it was cut ?

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A. I simply state that I did not measure the sheet.

X Q. 31. When did you first know of any expanded metal which s not shorter than the blank from which it was cut?

A. In 1903.

Cross-examination closed, reserving the right of recall for further amination with reference to the Golding & Durkee 1888 patent, counsel should deem it advisable, of which counsel will give notice thin ten days.

This notice is made without waver of objections heretofore entered th reference to the said patent and the testimony relating thereto.

Re-direct examination by Mr. Jackson:

R. D. Q. 1. Would it or would it not be possible in case of a known ortening of the sheet to make the sheet any length desired by ing a correspondingly longer blank for the production of the eet?

(Objected to as irrelevant and immaterial.)

A. You can make the sheet any length desired, commercially.

R. D. Q. 2. I call your attention to X Q. 30 and 31 and also to X Q. 26, in connection therewith. Would you or uld you not have been cognizant of the production of sheet metal ich was not shorter than the blank had such production occurred ior to 1903?

A. I would.

R. D. Q. 3. Had you or had you not *not* prior to 1903 measured any the sheets produced and compared them with the original blanks learn whether they were longer, equal to or shorter than said anks?

A. I had not.

Redirect examination closed.

EUGENE S. BRADFORD.

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186 Circuit Court of the United States, Eastern District of Pennsylvania. In Equity.

THE EXPANDED METAL COMPANY ET AL., Complainants,
vs.
EUGENE S. BRADFORD ET AL., Defendants.

PHILADELPHIA, PA., *July* 25, 1904.

Proofs for final hearing, taken on behalf of defendants pursuant to the 67th rule in equity, as amended, at De Long building, 13th and Chestnut streets, Philadelphia, Pa., before John A. Wiedersheim, notary public, acting by stipulation as examiner.

Appearances: Mr. Ernest Howard Hunter, for Complainants; Mr. E. Hayward Fairbanks and Mr. W. S. Jackson, for Defendants.

HOWARD A. COOMBS, called as a witness in behalf of Defendants, being duly sworn, testifies in answer to interrogatories by Mr. Jackson, as follows:

Q. 1. State your name, age, residence and occupation?

A. Howard A. Coombs, age 32, residence Washington, D. C., occupation Patent Attorney and Mechanical and Electrical Expert.

Q. 2. You are called upon to testify as an expert in a cause wherein Letters Patent and mechanisms and methods relating to the art of metal working are involved. Please state your qualifications to testify as an expert in a cause of this kind?

A. I am a graduate of the Worcester Polytechnic Institute
187 in the Mechanical and Electrical Engineering courses, and
subsequently to my graduation in 1893 I practiced my profession for several years. Thereafter I was appointed as an Assistant Examiner in the United States Patent Office, serving there for seven years, during the last six of which I was in charge of classes of patents and applications for patents, involving metal-working inventions of the character under consideration. Among these classes was that of making expanded metal, the same being then classified in the United States Patent Office under "Hardware, Miscellaneous, in Class 53, Hardware, Making." My duties during this time comprised the official examination of all applications involving the manufacture of expanded metal, requiring searches through all the prior patents and publications, including those in foreign languages, and the determination of the question of patentability of the claims of such applications. These duties necessarily called upon me to make a close study of all the machines and methods for making expanded metal and also of the products of such machines and metals.

During the period in which I had under my personal charge the classes above referred to, I was daily called upon in the discharge of my duties to pass upon all questions of novelty and patentable invention arising in connection with applications for metal work-

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ing inventions of the character above referred to, to compare structures as disclosed in such applications with similar or analogous structures as found in the prior art and to determine by such comparisons the similarity and dissimilarities between the same, as well as the patentable novelty existing in such applications.

Since resigning my position as Patent Examiner I have been actively engaged in my present profession of mechanical and electrical expert, and a great deal of my time since then has been spent in making what are known as "validity searches," the same
188 involving an even more extended search than those I was called upon to make while an official of the Patent Office.

I am a member of the American Society of Mechanical Engineers, and during the last four years I have been a frequent contributor to the technical press relating to the metal-working arts.

Q. 3. State in a general way the duties of a Patent Examiner in the United States Patent Office?

A. The duties of a Patent Examiner are of a judicial nature and, broadly speaking, are to determine the patentability or unpatentability of inventions or applications for patents. The labor of examining patent applications is divided among the members of the examining corps in each division. When an application for patent is filed in the Patent Office it is forwarded to the proper examining division and examined in its turn, the examiner first studying the specification and drawing of the alleged invention to ascertain if any informalities exist and then making his search, as well as he can, in the limited time at his command, through the United States and Foreign Patents and prior printed publications to which the invention appertains. If the examiner finds any patents which he thinks have a bearing on the invention he renders a formal written decision and requires the applicant to re-draw or modify the claims or specifications of the patent application. When the case is presented finally in all matters of form and merits, so as to comply with the examiner's requirements, it is allowed and after certain other formalities have been complied with the patent is issued, so that as I have already stated a Patent Examiner's duties are of a quasi-judicial nature.

Adjourned until Tuesday, July 26th, 10 a. m.

PHILADELPHIA, PA., *July* 26, 1904—10 a. m.

Met pursuant to adjournment, Present as before.

189 Q. 4. (The patent in suit shown witness.) Have you examined the patent in suit to Golding, No. 527,242, dated October 9, 1894, and do you understand the method of making expanded sheet metal therein described?

A. I have carefully read and studied that patent at various times, covering a period of several weeks, for the purpose of becoming thoroughly familiar with its disclosures of alleged novelty in and distinguishing characteristics of its subject matter. For the purpose of better understanding and measuring the meaning of its terms of description I have recently made a general study of the

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prior art for making expanded sheet metal, as disclosed by very many of the prior patents, domestic and foreign, on the subject. In the course of my duties as a Patent Examiner, having under my personal charge for several years the art under consideration, I frequently had occasion to consider said patent in regard to its relevancy to the claims of application for patents which I was examining, during my official connection with the Patent Office.

Q. 5. Upon the face of the Golding specification and drawings and entirely aside from the prior art, except as stated in the patent itself, please state briefly what the patent purports to disclose as new and constituting invention sought to be patented thereby?

A. The method described in the patent in suit comprises mechanical steps to be performed upon a "blank or thin sheet of metal, whereby the same will be transformed into what is known as "expanded metal" and the particular feature of novelty claimed for the method appears or is alleged to reside in the fact that the length of the blank sheet is not diminished during its treatment by the mechanical steps to be referred to, the width, of course, as usual becoming much greater.

This result is obtained by the use of a pair of relatively movable
cutters, B and C. The latter is stationary and has a straight
190 cutting edge, while the former is intended to be reciprocated
vertically past the cutting edge of the stationary cutter and is
formed or built up of a series of knives which appear to reciprocate vertically in unison, each having a truncated triangular operating edge, the combined series thus comprising a corrugated form of "alternate transverse projections *b*" and "recesses or intervening openings *c*."

The operation is stated to be as follows:

The blank sheet of metal A is fed transversely and intermittently between the cutters. The knife B, descending, forms a row of slits throughout the length of the blank sheet and carries down with it the metal thus separated from the main sheet, thereby stretching or elongating the sections of the metal which unite the central portions of the depressed parts to the main body of the sheet. The operation is then repeated, the blank sheet or the upper cutters B being shifted laterally so that the next row of slits will break joint with the former row.

The patentee states that "The bend given to the several portions, or strands as they are usually called, is in a direction at right angles to the plane of the sheet, and as there is no contraction in the length of the metal it necessarily follows that the expansion is obtained from the stretch, distention or elongation of the severed strands."

I would here remark that the patent in suit utterly fails to show or describe the actuating mechanism for the cutters B and C and it wholly fails to show or describe a complete unitary structure or an organized mechanism capable of uniformly and continuously carrying out the alleged mechanical steps recited in the claim. It shows no means for feeding the sheet, and how the operation described in lines 57 to 59, to wit:

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"and either the upper cutter or the sheet is shifted back and forth between the operations as will be understood,"

191 is carried out, it is impossible to cypher out from anything described or shown in the patent. The knives or cutters B and C are shown as hanging in mid air. So is the sheet or blank A. I know from practical experience that it requires considerable power to shear or slit a strip or sheet of metal. It certainly could not be done by manually moving the cutter B towards the sheet A which is the only means shown and while it is not in my province to say that the patent in suit is void by reason of a defective or insufficient specification or description I think if this rule were applied to this patent, as I have known it to be applied to similar cases wherein the patent has been held invalid, the Golding patent here in suit would meet the same fate.

Q. 6. To a person such as yourself, skilled in the art to which this invention relates, what does the specification in the descriptive portion thereof assert to be new and to constitute the "improvement" as you understand it?

A. On the face of the patent in suit it is described as being but a mere "improvement" in the following language at the opening of the specification:

"I, John F. Golding, * * * have invented a new and useful *improvement* in the art of expanding sheet metal, etc."

The specification of the patent in suit does not assert or even suggest anywhere that Golding was the first to manufacture expanded sheet metal or to recognize that sheet metal could be expanded by the mechanical steps of first cutting the slits at short distances apart, and then opening the metal at the cuts, thus formed, nor does it assert that there was any novelty in the mechanical steps of simultaneously cutting and opening the metal, by means of cutters set off or set relatively so as to make the slashes or cuts in different lines.

192 On the contrary, Golding's specification on its face distinctly recognizes that there was nothing whatever novel in the above mentioned mechanical steps of slitting and opening sheet metal, nor was there anything novel in the mechanical steps of slitting and bending the severed portions or strands to effect the desired result, as is clear from the statement of invention, to wit:

"In the manufacture of what is now generally known as expanded sheet metal it has been customary to first cut the slits in the sheet metal at short distances apart, and to open the metal at the cuts thus formed by bending the severed portions or strands in a direction at right angles substantially to the plane of the sheet. It has also been made by simultaneously cutting and opening the metal by means of cutters set off or stepped relatively so as to make the slashes or cuts in different lines in the manner set forth in Patents No. 381,230 or No. 381,231, of April 17, 1888. In both of these methods the product is somewhat shorter and materially wider than the original sheet, but *practically* no stretching or elongation of the metal forming the strands is caused."

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The patentee further states that:
"The invention consists in the improved method of making e
panded metal, namely, by simultaneously cutting and opening
expanding the metal at the cuts by stretching the severed portions
In view of the admission of the patentee in the opening stateme
of invention, it is manifest that the sole novelty, if any exist, mu
reside in the step of "stretching the severed portions," and this a
pears to be merely a question of degree, since lines 23 and 24 abo
quoted, seem to assert that in these prior patents some degree of th
so-called stretching exists, as evidenced by the following quotatio
"practically no stretching or elongation of the metal forming th
strands is caused."

I desire at this point to emphasize particularly the means whereb
this so-called "stretching" is attained by Mr. Golding, it b
193 ing apparent from Figures 2 and 3 of the patent in suit th
the same is effected by means of an upper or moving cutt
of peculiar construction, which is shown in said figures, as movi
in precisely a right angle to the sheet or blank A, the description
this operation being contained in the concluding part of the spe
fication, to wit:

"The bend given to the severed portion, or strands as they a
usually called, is in a direction at right angles to the plane of th
sheet, and as there is no contraction in the length of the metal,
necessarily follows that the expansion is obtained from the stretc
distension or elongation of the severed strands."

The point which I would particularly emphasize is that the ben
ing or "stretching" of the metal is in a plane at a right angle to th
plane of the sheet, and is so shown in Figures 2 and 3.

The mechanical steps by which the claimed method is carried o
are also again referred to in the following language:

"In the practice of the invention I prefer to make a series of sli
in a straight line across the edge of the sheet, and at the time
cutting the slits and as a continuation of that operation to depre
or stretch the severed metal, *i. e.,* those portions of the sheet lyin
outside of the cuts, in a direction at right angles to the sheet, witho
any contraction from the length of the original sheet. This ope
ation is then repeated after the sheet has been fed forward, the sli
being made opposite the portions unsevered at the previous operatio
and so on until the entire sheet is expanded. (Lines 34 to 47, pate
in suit.)

Q. 7. I now call your attention to the claim of the patent in su
and ask that without construing said claim you will describe th
mechanical steps recited therein?

A. The claim of the patent in suit consists of two mechanic
steps, to wit: First, "simultaneously slitting and bending portio
of a plate or sheet of metal in such a manner as to stretch or elonga
the bars connecting the slit portions and body of the sheet
194 plate," and second, "similarly slitting and bending in plac
alternate to the first mentioned portions."

The claim concludes with the functional statement "Thus pr

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ducing the finished expanded sheet metal of the same length as that of the original sheet or plate, substantially as described."

Q. 8. Say whether or not you have studied the prior art relative to the subject matter under consideration as disclosed in patents issued prior to the Golding patent here in suit?

A. I have made a careful examination and study of many such prior patents, both English and American, both during the several years that I had this general class of invention in my personal charge and since being retained in this case.

Adjourned until Wednesday, July 27, 10 A. M.

PHILADELPHIA, *July* 27, 1904—10 a. m.

Met pursuant to adjournment.
Present as before.

Q. 9. What do you find to be the state of the prior art as respects the subject matter of the claim of the patent in suit, and how far is the subject matter of said claim novel in view of said prior art? In your answer you may refer to such foreign and domestic prior patents as you may see fit?

A. Replying to this question I will refer, as showing the prior art, to the following patents:

British Patent to Long, No. 2125, of July 26, 1862.

The art to which the present alleged invention appertains is nearly half a century old. On July 26, 1862, Thomas Long left at the office of the Commissioner of Patents of Great Britain a
195 provisional specification, wherein he described the nature of his invention in these words:

"This invention relates to an improved manufacture of open metal work or metal trellis or lattice work, intended to be used as an economical substitute for ordinary wire netting or perforated metal, and applicable also to the manufacture of bird cages, basket stands and supports for flowers, fire guards, and other purposes where wire work has hitherto been employed. According to this invention, it is proposed to make open metal work or trellis or lattice work by making a number of slits in a flat sheet of metal, such slits being made in straight or curved lines or rows, the slits in each line or row being made to break joint with the adjoining lines or rows; a small portion of the metal being left intact or uncut between the ends of the several slits. The sheet, having been thus slit, is not *stretched* out so as to open the slits, whereupon a perfectly formed trellis, having hexagonal openings, will be produced. In order to form a finish and strengthen the edges of this open metal work, it is proposed to turn the edges of the plate before it is stretched and to insert therein a length of wire, which, when the metal is stretched, will remain threaded through each of the end tongues of the metal work. The slitting of the metal sheets may be effected either by

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suitable slitting rolls, stamping apparatus, or by hand cutters or tools, as preferred."

The above described process is fully and clearly set forth so as to be readily intelligible to one skilled in the art.

I desire to particularly emphasize that this British patent distinctly teaches the process of

> "making a number of slits in a flat sheet of metal, such slits being made in straight or curved lines or rows, the slits in each line or row being made to break joint with the adjoining lines or rows, a small portion of the metal being left intact or uncut between the ends of
> the several slits. The sheet being thus slit is now *stretched*
> 196 out so as to open the slits, whereupon a perfectly formed
> trellis having hexagonal openings will be produced."

The British patentee further teaches that "The slitting of the sheet metal may be effected, either by suitable slitting rolls, stamping apparatus or by hand cutters or tools." While the patentee, Long, did not deem it necessary to describe in detail the precise manner in which the *"stretching"* of the sheet is performed, it is clear that whatever be the character of the apparatus used for the *"stretching"* operation and however the bars connecting the central portions of the sheet are *"stretched"* and elongated, this would be in a sense merely a matter of degree.

I have had a considerable experience in actual practical work with sheet metals of a more or less ductile nature, and assuming that a more or less ductile or tough metal were employed, the connecting bars of Long's product might, in my judgment, be elongated somewhat, even if the slitted sheet were stretched by direct pulling on the edges thereof, that is, by such an operation as is generally disclosed in said British patent to Long.

U. S. Patent to Golding, No. 297,382, Granted June 10, 1884.

In this patent the same steps are disclosed as in the British patent to Long I have just referred to, to wit: The slitting of a sheet in rows, the slits of one row breaking joint with those of the next, and the subsequent *"stretching"* of the sheet.

This arrangement of the slits in staggered order, or so as to break joints is, however, a very old feature in this art, as is clearly disclosed in the patent to Walter, No. 73,765, granted January 28, 1868, a third of a century ago, and which contains a claim on said feature, which is also old in the patent to Elkin, No. 408,599, August 6, 1899. I would here remark that my views as regards the practical
operativeness of the process or mechanical steps, described in
197 the British patent to Long, are confirmed by the opinion of
Judge Sanborn, speaking for the Circuit Court of Appeals for the Eighth Circuit, in the case of Expanded Metal Company *vs.* Board of Education, 111 Fed. p. 395, since on pages 396 and 397 of this opinion the Court very clearly recognized the practicability of the steps recited in the Long patent and held that the Golding Patent, No. 297,382, just referred to, was invalid.

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Golding & Durkee Patent, No. 320,242, Granted June 16, 1885.

In this patent, granted nine years prior to the patent in suit, the rst step of the claim here in suit is fully answered, to wit, "the multaneous slitting and bending" of portions of the plate away om the plane of the metal. In my judgment it is clear that hether or not the connecting bars are stretched or elongated deends upon the distance to which the portions slit from the main heet or blank are bent down, which, as I have before stated, is erely a matter of degree.

olding & Durkee Patent, No. 381,230, Granted April 17, 1888.

In this patent is disclosed a machine for carrying out the process erein under consideration, since this machine, as therein described, omprises an upper vertical reciprocating bar M and a lower knife ar O, which can move horizontally but not vertically. The mutual peration of the knives carried by these bars on the sheet results in "downward shear cut" and that portion of the sheet between the nives is simultaneously cut and pressed downward by the movement of the upper knives or receding action of the lower knives, alowing said cuts to be expanded downward and to contract underise. I find that the mechanical steps referred to in the claim of the patent in suit are existent in the operation of the machine
98 of this patent, or in other words, the claim of the patent in
suit is merely a recital of the function or operation of the achine of patent No. 381,230.

My knowledge of the action of sheet metals of a more or less ducile nature under pressure leads me inevitably to the conclusion that f the portions slit from the main sheet remain substantially parallel o the edge of the latter and are carried down far enough by the pper knives or strands or bars connecting the slit portions with the ody of the sheet metal they must be expanded or elongated. In ny judgment, therefore, it is merely a matter of the amount of relaive movement of the knives, whether said strands or bars are elonated or not, or as I have stated in other words, merely a matter of legree.

British Patent to Johnson, No. 11,332, of September 23, 1885.

The teachings of this patent as regards the methods of making xpanded metal by the mechanical steps or slitting the sheet at alernate points, and next "stretching" the sheet at the desired points o produce the expanded or "stretched" product of the same length s the original sheet or blank, are so full and clear and constitute uch a complete disclosure of the steps of slitting and "stretching" he sheet that for the convenience of the Court I will here quote he entire specification of this patent:

"This invention has for its object to manufacture simply, expeitiously and cheaply metal sheets into lattice work, trellis work, ieving or equivalent open metal work. According to this invention metal sheet is taken and at intervals rows or circles of slits or slots

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are formed, the slits or slots of each row 'breaking bond' with those of the adjacent row or rows. The plate is then pulled in a direction or directions transversely to the length of the slits or slots and over a suitable former or mould if desired and there is thus pro-
199 duced an open metal work suited to the purposes to which ordinary lattice work or woven or interlaced metal strips or wires are usually applied.

"And in order that this invention may be fully understood I shall now proceed to describe more particularly with reference to the accompanying drawing the manner in which the same may be performed.

"Figure 1 represents a metal sheet having longitudinal parallel slits formed therein ready to be stretched or pulled and opened out, and Figure 2 represents the same sheet after it has been stretched or pulled and opened out.

"Figure 3 shows a circular sheet of metal provided with concentric slits ready to be pulled or stretched and opened out.

"A sheet *a* of any suitable metal or alloy capable of being rolled, such for example as iron, steel, brass or the like, and of the required thickness is taken and placed in a suitable machine or operated upon by a cutting or stamping instrument to produce therein parallel rows of slits or slots as shown at *b* in *in* Figure 1, in such a manner that the full parts *c* of one row or range of slits are opposite to the slitted parts *b* of the adjacent row or rows, as shown in Figure 1. A slotting machine of any well known or suitable construction may be employed for making the slits in the plate *a*, care being taken that the slits of the several rows are arranged in the particular manner before described and shewn, so that when the sheet is pulled stretched or opened out openings will be formed as shewn.

"The sheet *a* thus slitted or slotted is then pulled or stretched in the direction of the arrows *d, d,* that is to say transversely to the direction of the slits. The sheets *a* may be pulled or stretched either when moulded or it may be heated before being stretched.

"This pulling or stretching or opening out of the slits or slots may be effected by means of any suitable stretching apparatus,
200 such for example as the combination of pair of blocks between which the opposite sides of plate are held, the blocks being forced apart by screw or other power.

"By stretching out the sheet the lattice work having hexagonal openings or meshes is formed as shewn in Figure 2, and according to the size of the meshes the area of the lattice or trellis work produced will be increased over that of the unstretched sheet or plate.

"In the modification illustrated by Figure 3 the circular metal sheet *a* is provided with concentric rows of slits and is intended for use in making baskets or other articles of a cylindrical, circular or conical form.

"This may be effected in any convenient manner, such as by stretching the sheet out or over a form or model of the required shape by means of suitably arranged stretching mechanism as hereinbefore mentioned.

"The length or size of the slits or slots and their distance from

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each other as well as the kind of metal and thickness of sheet employed may be varied according to the quality and purpose for which the article to be produced is to be used. Metal lattices or trellis work constructed as hereinbefore described may be advantageously employed in place of that hitherto made by netting or twisting metallic wires or by riveting strips or bands of metal together by means of costly and complicated machinery.

"Having now particularly described and ascertained the nature of this invention and in what manner the same is to be performed, I declare that what I claim is—

"1st. The manufacture of open metal work for use as trellis work, lattice work, sieving or other purpose by slitting or slotting a plate or sheet of metal and afterwards pulling, stretching or opening out the slitted or slotted sheet or plate substantially as hereinbefore described.

201 "2nd. Articles for use as trellis work, lattice work, sieving or other purpose for which interlaced or interwoven strips are employed, the said articles being made from slitted or slotted and stretched or opened out metal sheets or plates, substantially as hereinbefore described.

"3rd. The articles of open metal work produced by slitting or slotting a metal plate or sheet and stretching and forming it over a shape or mould substantially as herein described."

Now it is manifest that any pulling of the slitted or slotted sheet, over a former, would according to the ductility of the sheet of metal result in elongation or "stretching" of the strands or bars, connecting the slit portions with the main body of the sheet. I would further call attention to the fact that Figure 2 of the British patent to Johnson shows the finished expanded sheet as being exactly the same length as the original sheet seen in Figure 1, prior to expanding.

If it be asserted that the British Patentee Johnson, does not show in detail the actuating mechanism, whereby the so-called "stretching" is effected, the same objection is of equal force, as regards the specification of the patent in suit.

Adjourned until Thursday, July 28th, 10 A. M.

PHILADELPHIA, *July* 28, 1904—10 a. m.

Met pursuant to adjournment.
Present as before.

Direct examination of Mr. COOMBS continued:

Witness continues his answer.

202 In conclusion, it is my opinion that the mechanical steps recited in the claim of the patent in suit, are fully disclosed in the prior art, particularly the Golding & Durkee patent, 381,230, and the two British patents to Long and Johnson, and in such a manner as to teach one skilled in the art the mechanical steps recited in the claim here in suit, since in any case, it is merely a matter of degree, depending more or less upon the ductility of the sheet of metal or blank employed, as to whether or to what extent the bars or strands are "stretched" or elongated or not.

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(File wrapper of patent in suit shown witness.)

Q. 10. In your previous answer you have referred to the United States patents to—

Golding, No. 297,382, granted June 10, 1884,
Golding & Durkee, Patent No. 320,242, granted June 16, 1885,
Golding & Durkee, Patent No. 381,230, granted April 17, 1888,
and the two British Patents, No. 11,332 of 1885, to Johnson, and No. 2125 of 1862 to Long, now state if you have examined the file wrapper of the patent in suit, and if so, say whether or not you find in the record thereof, anything to indicate whether or not any of these patents referred to by you were before the Patent Examiner who granted this application?

A. I have examined the certified copy of the file wrapper here in suit, and find that when the patentee Golding filed his application, it contained but a single claim, reading as follows:—

"The improvement in the art of manufacturing expanded metal, consisting in simultaneously slitting the sheet and stretching the severed portions."

Prior to the first official action the applicant Golding, added another claim, reading as follows:

"The herein described method of making open or reticulated metal work, which consists in simultaneously slitting and stretching portions of a plate or sheet of metal away from the plane of the sheet, and then simultaneously slitting and stretching away from the plane of the sheet subsequent portions of the sheet in planes alternate to the first mentioned portions, and by each successive slitting and stretching operation forcing the metal already operated upon
203 further away from the original plane of the sheet, substantially as set forth."

The Commissioner of Patents thereupon rejected Claim 1 in a letter dated June 18, 1894, reading as follows:—

"This case has been examined. Claim 1 is found to be anticipated by patent to Ohl, No. 475,700, May 24, 1892, (Builder's Hardware). So far as at present advised Claim 2 appears to be allowable. Claim 1 is rejected."

Thereafter the applicant Golding conceded that the mechanical steps recited in Claim 1, reading as follows:—*"the simultaneous slitting of a sheet and stretching the* severed portions" were old, since in the letter to the Office of June 20, 1894, the said claim was canceled, as per the following amendment:—

"I hereby amend the above-mentioned application by canceling Claim 1."

Thereafter the Commissioner of Patents upon further consideration of the single claim now in the case (Claim 2 *supra*), wrote the following letter of rejection saying, *inter alia:*—

"The above-named case has been reconsidered and it is thought that the claim does not clearly set forth applicant's invention, nor distinguish the present case from the patent granted applicant June 16, 1885, No. 320,240. The claim is therefore rejected."

As a result of this last office letter of rejection the following claim was presented:—

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"The herein described method of making open or reticulated tal work, which consists in simultaneously slitting and bending rtions of a plate or sheet of metal in such manner as to stretch or ngate the bars connecting the slit portions and body of the sheet plate, and then similarly slitting and bending in place alternate the first mentioned portions, thus producing the finished expanded sheet metal of the same length as that of the original sheet or plate, substantially as described," this being the claim which now appears in the patent.

I therefore find in conclusion, that, as it appears from the history proceedings in the Patent Office, the only prior art patents apparntly known to the Examiner were the patents of Ohl, No. 475,700, ay 24, 1892, and Golding, 320,240, June 16, 1885. No other tents were cited.

Q. 11. Referring once more to the file wrapper of the patent in it, please state if there is any warrant for the assumption that olding's patent was the first to describe the mechanical steps of anufacturing expanded sheet metal, consisting of simultaneously tting the sheet and stretching the severed portions?

A. There is not the least warrant for such assumption. The e wrapper which I have just referred to shows that Golding recnized that the steps of simultaneously slitting a sheet and stretchg the severed portions were old, since the original claim to this ature was cancelled in view of patent No. 475,700.

Furthermore, the teachings of the prior art patents to which I ferred to in detail, show that the steps of slitting and stretching, re old and the drawing of the British patent to Johnson further ows that it was old to produce the finished expanded sheet of the me length, as the original blank.

Q. 12. You have already explained the apparatus, wherein the mplainants' mechanical steps are performed, now state if you are miliar with the apparatus of defendants and if so, briefly explain e same.

A. The apparatus employed in the machine of the defendants herein, as I understand it, the mechanical steps complained of ve been alleged to have been experimentally carried out, is conructed in substantial accordance with the patent to E. S. Bradford, 4,379, granted December 25, 1900. As a detailed description of e defendants' machine would be merely a repetition of the specification of this patent, I will confine myself for the present to but a brief explanation of the principal operative parts of this machine. In the specification of the defendants' Bradrd patent, I find on lines 13 to 19 clear differentiation or disaimer of the devices of the prior art, the language reading as follws:—

"Heretofore in machines used for a similar purpose the sheet metal s been slit and expanded into the form desired either by subjectg it to the action of two converging series of rotary cutters and panders or to the action of reciprocating knives."

This latter clause relates particularly to machines of the Golding pe.

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In lines 20 to 40 of the Bradford specification, which read as follows:—

"The machine of my present invention differs essentially from preceding machines in that but a single series of rotary cutters and expanders is required, the metal being fed to these cutters or expanders at an angle.

The principal object of my invention is therefore, to provide a machine for expanding metal, having but a single series of rotary expanding cutters arranged in alignment, the sheet of metal being fed to these cutters at an angle to the plane in which the cutters rotate.

Further objects of my present invention are, first, to provide, in conjunction with the single series of expanding-cutters, a series of circular cutters, replacing the stationary or reciprocatory knives formerly used; second, to locate these circular cutters slightly in advance of the expanding-cutters, so that the circular cutter may act as a support for the metal during the shearing and expanding operations;"

it will be seen that defendants', Bradford's, device is clearly differentiated from those of the prior art in numerous particulars. The metal is fed to the cutters or expanders at an angle, and a single series of rotary expanding cutters is arranged in alignment
206 and the sheet of metal is fed to these cutters at an angle to the plane in which the cutters rotate. The circular cutters are located slightly in advance of the expanding cutters, so that the circular cutter may act as a support to the metal during the shearing and expanding operation. A feed roll is located eccentrically with respect to the shaft of each expanding cutter so as to be directly above the circular cutter so as to assist the latter in the feeding of the sheet.

The defendants' Bradford machine is further provided with a bed or table over which metal is fed and this bed is provided with a series of transverse slots, wherein the guide rolls are adapted to be adjusted for the purpose of determining the relative angle at which the metal is to be presented to the cutters. There are other improvements in various details, and they are well stated in the Bradford specification.

It will be apparent that by reason of the construction, and location of the parts and the manner of operating or feeding the sheet to the cutters, as seen in Figures 3 and 11 of the Bradford patent, No. 664,379, the finished product of the expanded sheet will in each instance be somewhat longer or of greater length than the original sheet or plate. In order that the differences between the apparatus or mechanisms of the complainants and defendants may be clearly brought out, I have prepared a drawing, marked "Coombs Comparative Drawing No. 1," in the upper portion of which I have reproduced Figures 2 and 3 of the Golding patent here in suit, while at the lower portion thereof I have reproduced Figures 3, 8 and 12 of defendants' Bradford patent above referred to. While the description of the actuating mechanism of complainant's machine of the

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patent in suit is of a most meagre nature, and can only be ciphered out with the greatest difficulty, it is clear that the same is of a very crude nature, since, as I have heretofore explained, it discloses no means for mechanically feeding the blank, nor for adjusting
207 or reciprocating the knives nor for actuating the same.

In the case, however, of the defendants' Bradford machine the specification of this patent 664,379, so clearly brings out the advance it made in this art, that I will again quote from its statement of invention, since every one of the points of difference therein referred to was admitted by the Patent Office to be wholly new and to not conflict with the prior patents in this art:

"Further objects of my present invention are, first, to provide, in conjunction with the single series of expanding-cutters, a series of circular cutters, replacing the stationary or reciprocatory knives formerly used; second, to locate these circular cutters slightly in advance of the expanding-cutters, so that the circular cutter may act as a support for the metal during the shearing and expanding operations; third, to provide, in conjunction with the expanding-cutters and circular cutters, a feed-roller located eccentrically with respect to the shaft of each expanding-cutter, so as to be directly above the circular cutter and to assist said circular cutter in the feeding of the sheet; fourth, to provide each expanding-cutter with a holder which can be readily and quickly secured or removed from the shaft of the expanding cutter by means of a single nut and to which hoider the expanding-cutter is firmly secured; fifth, to provide set and binding screws by means of which the expanding-cutter may be adjusted on its holder toward or away from the face of the circular cutter; sixth, to provide an expanding-cutter, its shaft, and the holder for securing the cutter to said shaft with splines or keys, whereby the cutter when removed from the shaft may be replaced thereon to occupy the same relative position with respect to its expanding-prongs as it did prior to its removal from the shaft; seventh, to provide in such a machine a bed or table over which the metal is fed, said bed being provided with a series of transverse slots, wherein guide rolls are adapted to be adjusted, said guide-rolls determining the relative angle at which the metal is to be presented to the cutters; eighth, to provide in such a machine
208 means whereby the expanding-cutters and their shafts may
be arranged eccentrically with respect to the feed-rollers on said shafts, so as to permit the feed-rollers to rotate directly above the lower circular cutters and the expanding-cutters to rotate a little beyond the circular cutters; ninth, to provide means for adjusting the shafts of the lower set of cutters transversely and vertically in the machine with respect to the frame, so as to compensate for wear and tear upon the cutters, as well as permit sheets of varying thickness to be cut, and, tenth, to provide adjacent to and in the rear of each expanding cutter a stripping-roll adapted to prevent the expanded metal from buckling upward in the machine."

(Specification Bradford patent, No. 664,379, page 1, lines 32 to 85.)

Adjourned until Friday, July 29th, 10 A. M.

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PHILADELPHIA, *July* 29, 1904—10 a. m.

Met pursuant to adjournment.
Present as before.

Q. 13. Say whether or not you find the Defendants' Bradford machine capable of performing the mechanical or functional steps recited in the claim of the patent in suit.

A. I do not find in the defendants' machine, an apparatus capable of producing finished, expanded sheet metal of the same length as that of the original sheet or plate, for reasons I have hereinbefore explained. It is, however, doubtless true that the defendants' Bradford machine can simultaneously perform the mechanical steps of slitting and expanding the sheet, all of which was admitted by Golding to be old, as shown by the contents of his file wrapper, as I have explained in my answer to your question 10. These steps are furthermore shown to be old in the Golding & Durkee patent, No. 381,230, as I have explained.

To show the analogy between the steps in and the product
209 obtained from, this last mentioned patent (granted six years
prior to the patent in suit) and the defendants' Bradford patent, I have prepared a drawing marked "Defendants' Exhibit, Coombs Comparative Drawing No. 2," wherein I have reproduced on a single sheet, Figure 11, of Golding & Durkee patent No. 381,230, and Figure 12 of Defendants' Bradford patent, No. 664,379.

In summary I would say that if the mechanical steps of the patent in suit are present in defendants' Bradford machine, they are present in the prior Golding & Durkee patent, 381,230, granted six years before. If the claim of the patent in suit, to save it, has read into it, the functional recital of producing the finished sheet of exactly the same length as the original, such function is not present in the defendants' Bradford machine.

Q. 14. What knowledge have you as to the system of classification of patents and applications for patents, in the art under consideration, in about the early nineties, or at about the time the patent here in suit was granted?

A. At that time the system of classification in vogue in the Patent Office was in a very unsettled and chaotic condition, so much so in fact that it at last became necessary to establish an additional division, called the "Classification Division," which has been created now for some four or five years and consists of a chief, and a large corps of assistants, whose sole duty is to correctly classify all patents and applications for patents about which any dispute may arise. As regards the particular art under consideration, I well recall the trying and arduous nature of my duties in making a complete and satisfactory search upon each pending application assigned to me, since in some instances the prior art patents, both domestic and foreign, were scattered in various sub-classes of the Patent Office. As a single instance in this art of a United States patent inadvertently granted to the same patentee, as the patentee of the patent
here in suit, I would mention, the patent Golding, No.
210 297,382, June 10, 1884, which was improperly and inad-
vertently granted in view of the British patent to Long

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July 26, 1862. This Golding patent was declared invalid by the United States Circuit Court of Appeals for the Eighth Circuit in 111 Feb., p. 395, as I have already explained in my answer to your question 8.

Defendants' council offers in evidence all the United States and British patents that have been referred to by the witness in his preceding answers, and the Examiner marks each of the same with its proper number and name, in connection with the words "Defendants' Exhibit."

Defendants' counsel also offers in evidence a certified copy of the file wrapper of the patent in suit, which is marked "Defendants' Exhibit, File wrapper, patent in suit."

Defendants' counsel also offers in evidence "Coombs comparative drawing No. 1" and "Coombs comparative drawing No. 2" and the same are so marked by the Examiner.

Direct examination closed.

Adjourned to a date to be agreed on.

Met pursuant to agreement of counsel on Tuesday, September 6, 1904, at 2.30 P. M., at 926 Walnut Street, Philadelphia.

Present, Mr. E. H. Hunter, for complainant. Mr. E. H. Fairbanks, for defendants.

Direct examination of Mr. COOMBS resumed.

By Mr. FAIRBANKS:

Defendants' counsel offers in evidence patent to Ohl, No. 475,700, granted May 24, 1892, and the same is shown the witness.

Q. 15. Please look at the patent just offered in evidence 211 and say whether or not you understand the construction disclosed therein, and without construing the claim of the patent in suit, say whether or not you find in said Ohl patent an apparatus capable of performing the mechanical steps recited in the claim of said patent in suit.

A. I am quite familiar with the construction of apparatus disclosed in the patent to Ohl mentioned in your question and find that said apparatus is described as performing the following steps:

(1) Simultaneously slitting and bending portions of a plate or sheet of metal in such a manner as to stretch or elongate the bars connecting the slit portions of the sheet or plate, and

(2) Similarly slitting and bending in places alternate to the first mentioned portion.

Referring to Fig. 10 of the patent the plate or sheet of metal is represented at S, which is subjected to the action of slitting and holding dies *a* and *e*, whereby portions of said sheet or plate S are bent down out of the plane of said sheet and elongated as shown at S in Fig. 11. The same operation is then repeated on the sheet at places alternate to those first operated upon. I find therefore disclosed in this patent the two steps of the process positively set forth in the claim of the patent in suit.

Direct examination closed.

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Cross-examination by Mr. HUNTER:

X Q. 16. It is your understanding, is it not, that where in Long's British provisional specification, to which you have referred, reference is made to the slit of metal as being "stretched out," the word "stretched" is used in the same sense in which it is used in Golding's 1884 patent?

A. The disclosure of the British provisional specification, referred
to, is not very definite as to the means employed for open-
212 ing or "stretching" the slit sheet. I should, however, under-
stand the term as meaning generally an enlargement of the area of the original blank sheet, more or less. As I understand it, the slit sheet is stretched by a tensional force applied to its edges transversely to the direction of the slits. The extent to which this stretching is performed is not definitely stated.

X Q. 17. Does your answer mean "yes" or "no?"

A. I am unable to state specifically whether the term "stretch," as used in said British specification, means exactly the same thing as the same term as used in the Golding 1884 patent.

X Q. 18. You must have had some understanding as to the meaning of this term when you testified, and I want to know what that understanding was?

A. The British patentee states "The sheet having been thus slit, is now stretched out so as to open the slits, whereupon a perfectly formed trellis having hexagonal openings will be produced." I certainly understand by this that the slit sheet is subjected to a pulling operation whereby the slits are opened out so as to form hexagonal openings in the finished product.

X Q. 19. And you understand the same thing to be meant by the statement in Golding's 1884 patent that after the sheet is slashed "it is stretched in a line transversely to the length of the slashes or cuts, thus forming meshes as shown in Fig. 2?"

A. I understand that the same or a similar operation is intended to be performed on the slit sheet as shown in Fig. 1 of the Golding 1884 patent referred to in order to produce the finished product shown in Fig. 2 of said patent, but whether or not the British patentee performed his stretching operation in the same way, or limited it to the extent shown in the Golding patent, I am unable to state with certainty.

X Q. 20. And is it your understanding that similar operation is referred to in Johnson's 1885 British patent to which you have referred?

213 A. The British patent to Johnson referred to in your
question does not show any apparatus for performing the
stretching or opening operation, but my understanding of it is that the slit sheet as shown for example in Fig. 1 of said patent is subjected to a tensional or pulling stress at right angles to the direction of the slits, whereby the latter are opened out into the form shown in Fig. 2 of said patent.

X Q. 21. And this is the same as the pulling, stretching or opening out which is described in the Golding 1884 patent in Long's British provisional specification?

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A. Undoubtedly the same operation is intended to be performed on the slit sheets of each of the three patents referred to, but whether or not the operation of the two British patents is limited to a mere pulling apart of the adjacent edges of the slits, or whether the same is continued to actually stretch or elongate the metal I am unable to state.

X Q. 22. In each of these cases the sheet is slit throughout, that is, it is formed with all the slits or cuts necessary to make all the meshes before the pulling out or stretching operation; is that the case?

A. That is so.

X Q. 23. And it results from this that there is nothing to prevent the opening up of the meshes in successive rows when the slit metal is pulled out or stretched?

A. If I understand the question right, there is in each of the three patents referred to nothing to prevent the successive or simultaneous opening of the rows of slits.

X Q. 24. And if that stretching operation were continued it would result in further opening up the meshes to such an extent that their axes would extend transversely to the length of the original sheet instead of longitudinally?

A. Continuation of the stretching operation would undoubtedly change the shape of the meshes of the expanded metal so as
214 to make the axes of the same lying in the direction of pull
longer than the axes lying transversely to said direction. A further continuation of pull would probably stretch the strands uniting the unslitted portions of the sheet.

X Q. 25. And in order to produce this elongation of the strands it would be necessary to continue the stretching operation to that extent, which would change the direction of the axes of the meshes in the manner you have described?

A. The operation stated by you would, I think, result from a continuation of the pulling stress if applied to the edges of the slit sheet if said stress is applied to the edges of the sheet in a line transversely to the direction of the slits. The specification of the British 1885 patent to Johnson, however, states that the opening or stretching may be performed "over a suitable former or mould if desired," and I believe by the use of such a former or mould the shape of the meshes could be maintained even if the strands were to be elongated.

X Q. 26. Do you not understand the reference to the stretching of the sheet over a form or model refers merely to a form over which the metal may be placed for the purpose of imparting to the metal when opened up or expanded some particular shape, such as a cylinder or a basket form, and that whether or not such form is used the stretching or pulling out operation will be the same as that described on page 2 of the specification, lines 37 to 40?

A. My understanding of the patentee's meaning where he states in line 10, etc., of page 2 that "the plate is then pulled in a direction or directions transversely to the length of the slits or slots and over a suitable former or mould if desired," is that he places the slit plate upon some kind of longitudinal form or mandrel and then by pres-

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sure applied to the sheet on opposite sides of said form or mandrel
the slits or slots of one row are opened out. If this a correc
215 interpretation of the patentee's meaning it would be quit
possible for him to stretch the strands uniting the unslitte
portions of the sheet without necessarily deforming the shape of th
meshes.

X Q. 27. In this method I understand that the rows of meshe are opened up separately by some devices acting upon one row o meshes at a time; is that your meaning?

A. That is the way I construe the probable operation of th method of the patent in question where a "former or mould" i employed.

X Q. 28. Will you refer to any part of Johnson's specificatio which in your opinion discloses any such method or justifies you i this interpretation of the words you have referred to?

A. The specification nowhere states in so many words that on row of slits is opened at a time, but I cannot conceive any othe operative construction to be put upon the language quoted in my last answer; in other words, I do not understand what is meant by the "former or mould" unless it is to be used in the manner I hav attempted to describe.

X Q. 29. What do you understand to be meant by the term "form or model of the required shape" used in line 7 of page 3?

A. I understand by the terms referred to a form of the kind whic I have hereinbefore described.

X Q. 30. Is it not in your opinion the simplest and most logical if not the only sensible, meaning of these terms that they refer to form over which the metal may be placed for the purpose of impart ing to it when opened up or expanded some particular shape, suc as a cylinder or basket form?

A. I understand from the specification of the patent that when basket or other article of cylindrical form is to be made, a circula plate is taken and concentric rows of slits cut therein as shown i
Fig. 3. The patentee's statement, however, that the plat
216 may be stretched or opened "over a suitable former or mould'
is not limited as I understand it to this circular form o
plate.

X Q. 31. Do you not consider the statement of the meaning o these terms mould or form contained in my cross-question 30 perfectly simple and possible one? or do you find something in th specification of the Johnson patent which prevent you from givin to those terms this simple meaning?

A. As I understand this patent when the circular plate is use the slits therein are to be opened out by pulling the plate around suitable mould or former, but as I read the patent, I do not thin that the use of such a form or mould is intended to be limited t instances where the circular plate is used.

X Q. 32. I do not care to limit the patentee Johnson to a cylin drical mould or former; it may be rectangular, triangular or an convenient form you wish. I wish to know whether it is not bot a possible and a simple explanation of the meaning of the term "former or mould" or "form or model of the required shape" that they refer to a form over which the metal may be placed for the purpose of imparting to it when opened up or expanded a shape corresponding with that of the mould or former?

A. I do not find in the specification of the patent any statement to the effect that former may be rectangular, triangular or of any other form than cylindrical or conical, and it is my opinion that where such a former was used the slit sheet could not be opened up as a whole, but that the slits would have to be successively opened around the edges of such a former.

X Q. 33. Irrespective of whether or not the metal could be stretched over such a former in the manner described by Johnson, please state whether or not the explanation of the meaning of the terms "former or mould" and "form or model of the required shape" given in cross-question 32, is not a possible and simple one?

217 A. The meaning given to said terms in said question is, I believe, a possible and simple one where the circular slit plate is referred to.

X Q. 34. And that is the only form of plate shown or described in the patent except the plain rectangular sheet?

A. That is so.

X Q. 35. And in describing the manner of stretching the sheet over "a form or model of the required shape," the patentee says it may be effected "by means of suitably arranged stretching mechanism as hereinbefore mentioned."

A. That is a correct statement of the patentee's description, but it is used in describing the formation of the circular metal sheet *a* into "baskets or other articles of a cylindrical circular or conical form."

X Q. 36. And the only form of stretching mechanism described in the patent is that referred to in lines 37 to 40, to wit: "Any suitable stretching apparatus, such for example as a combination of pairs of blocks between which the opposite sides of plates are held, the blocks being forced apart by screw or other power."

A. The statement quoted is the only description of the pulling or stretching mechanism mentioned in the patent.

X Q. 37. Do I understand you testify that in your opinion Fig. 2 of Johnson's patent is meant to show the correct length of the expanded metal sheet formed from the slit sheet shown in Fig. 1 after it has been stretched out?

A. Fig. 2 of the Johnson patent represents as stated by the patentee in his specification the same sheet as is shown in Fig. 1, the latter Figure showing the sheet before it is stretched or opened out. In both of these Figures the sheet is shown of identical length, so that evidently the operation of stretching or opening the
218 slit sheet as carried out by the patentee did not increase the length thereof.

X Q. 38. Is it your opinion as an expert and a former Examiner in the Patent Office that Fig. 2 of the Johnson's patent correctly represents the sheet shown in Fig. 1 after it has been expanded or stretched out in the manner described in Johnson's patent?

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A. Yes, sir; I have no reason to believe that the drawing of the British patent to Johnson which was evidently made to scale is incorrect in any particular.

X Q. 39. I would direct your attention to the fact which you have manifestly overlooked that the sheet shown in Fig. 2 could not possibly represent the sheet shown in Fig. 1 after stretching, for the obvious reason that it is only one-half the width Had you not overlooked this fact in answer to the last question?

A. I think that the reason that the drawing of the patent under consideration shows in Fig. 2 a plate of only half the width of the plate shown in Fig. 1 is that for the sake of symmetry in the drawing and to omit unnecessary work on the part of the draughtsman, a portion only of the expanded plate was shown. Obviously it would be merely an unnecessary repetition on the part of the draughtsman to illustrate the entire plate when opened out, and it would have unnecessarily encumbered the sheet. I have often seen during my experience as an Examiner in the Patent Office portions only of parts represented when nothing would be gained in clearness by showing the entire article. It being merely the object of the patentee to illustrate the appearance of the finished product made from the blank shown in Fig. 1, it would clearly have been superfluous to have multiplied the meshes of the opened plate shown in Fig. 2.

X Q. 40. And your answers in cross-questions 37 to 38 that Fig. 2 of Johnson's patent shows the same sheet as Fig. 1, the latter Figure showing the sheet before it was stretched or opened out was not correct.

219 A. Fig. 2 shows a portion of the plate of Fig 1, namely one-half of the width thereof, the rest being omitted for the reasons given by me in my last preceding answer.

X Q. 41. Is it your opinion as a mechanical expert that it would be a physical possibility to produce a sheet of expanded metal capable of commercial use by the methods of stretching or pulling open described in Johnson's patent from a sheet metal of the character shown in Fig. 1 of that patent which would have the character of the metal shown in Fig. 2 of that patent and yet have the same length as the original sheet?

A. As I have here-ofore stated, the methods employed by the patentee for stretching or opening out the slit sheet are not described with great particularity or details. I believe, however, that a sheet of expanded metal suitable for commercial use could be produced on the blank sheet shown in Fig. 1 by stretching the latter or opening up the slits by a pulling operation. This operation is that disclosed also in the Golding 1884 patent which I have reason to believe produced a commercial article.

X Q. 42. I will now ask you to describe the method or means which you would use for pulling or stretching or opening out the slit sheet shown in Fig. 1 of Johnson's patent to obtain a sheet of expanded metal of the character shown in Fig. 2 of the patent of the same length as the original sheet?

A. The patentee states that the stretching or opening out of the slits may be effected by "a combination of pairs of blocks between

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h the opposite sides of plate are held, the blocks being forced by screw or other power." I should understand by this that ontemplated attaching at suitable intervals along the opposite of the sheet suitable clamps to which then power was applied rce or pull the same apart. This means unaided would, it would seem, have a tendency to shorten the sheet. This tendency might be counteracted by applying some similar means for exerting tension to the corners or ends of the sheet. How- I believe that the means employed by the patentee for the pur- of expanding the sheet without shortening the same consisted ie "former or mould" described by him. Unfortunately he has illustrated the use of such a former or mould, but my under- ling of the same as expressed in my answer to cross-question 26 ld permit of such an operation.

Q. 43. You do not find in Johnson's patent, do you, a descrip- of any devices for exerting tension to the corners of the sheet to ent them becoming shortened when stretched out?

. No, sir; I do not.

Q. 44. And do you not find any description of any former or ld capable of preventing the shortening of the sheet?

. As I have stated, the manner in which the former or mould tended to be used, is not described in detail or illustrated. Since, ever, the patentee specifically states that Fig. 2 represents the t of Fig. 1 after it has been opened out, and as he is presumed now what he is talking about, I should judge that his manner sing the former or mould is such that the sheet is not lengthened he operation of opening the slits.

Q. 45. I regret that you should again refer to Figures 1 and 2 howing the same sheet, before and after stretching, in view of the nission you have recently made that you were incorrect in your ement. Do you now wish to take back that admission, or are still willing to admit that the patentee Johnson's statement which arently misled you that Fig. 2 represents the same sheet as Fig. fter it has been stretched or pulled or opened out, was incorrect?

Mr. Jackson: Objection is made to the inference drawn from the witness' explanation that although the same sheet is shown, there is not illustrated the entire body of said sheet. h statements by the witness are explanation and not admission.

. I did not admit, nor am I willing to do so now, that Fig. 2 of Johnson patent does not show the same sheet as Fig. 1. As I e explained, said Fig. 2 shows a portion of the expanded sheet ich would be made from the blank of Fig. 1. The rest of said anded sheet having been omitted simply for convenience, as it ld not aid at all in illustrating the appearance of the sheet after ing been expanded.

Q. 46. However, the statement is not correct that he shows the ie sheet, as the Figure only shows part of the sheet; is not that e?

. It is true that Fig. 2 does not show the entire sheet which

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would be made by expanding the blank shown in Fig. 1. The part omitted, however, would be simply a duplication of that shown.

X Q. 47. You have stated that by the use of some kind of longitudinal form or mandrel and then by pressure applied to the sheet on opposite sides of said form or mandrel the slits or slots of one row may be opened out so as to expand Johnson sheet in such manner as to stretch the strands and produce an expanded sheet of the same length as the blank. Now will you please explain in detail the exact form of mechanism you would employ and the manner in which you would use it for the purpose of producing this result?

A. While I have not of course designed or worked out in detail the exact form which the mechanism referred to might take, yet I will endeavor to express in general terms the idea which I formed of the mechanism mentioned in the patent and of the method of operation of the same by which the result referred to could be obtained.

The form or mould as I conceived the same would be a
222 sort of straight edge over which one edge of the blank sheet
would be placed with the first row of slits directly over the further edge of said former. A die or plunger, if a machine were used or a manually applied bar would then be brought down upon the projecting end of the sheet and at the same time the sheet would be firmly held on the top of the former or straight edge. The die or bar would be provided with means to engage in the slits and by its downward movement would draw the projecting end of the sheet downwardly in the plane at right angles to the plane of the sheet, while the main body of the sheet would be firmly held stationary. It would then be merely a question of the extent of downward movement of the die or bar whether or not the length of the expanded sheets would exceed that of the blank sheet.

X Q. 48. And you think you find foundation for the use of all this mechanism in the statement of the patent of Johnson, "*that the plate is then pulled in a direction or directions transversely to the length of the slits or slots* and over a suitable former or mould if desired," or do you find something else in the specification of Johnson's patent on which to hang this process or method you have just described?

A. As I have stated before, the specification of the Johnson patent is very meagre in its description of the apparatus employed for stretching or opening these slit sheets. It contains no detailed description of the mechanism and mode of operation which I have described in my last answer, but the mechanism and mode of operation is that which I conceive as being probably something like the patentee must use in order to obtain the result shown. It seems to me that the conception of such apparatus and its method of use would naturally suggest themselves to one familiar with the art of sheet metal working after a perusal of the specification and an inspection of the drawing of said Johnson patent. At any rate
223 the mechanism and method described are those which might
naturally suggest themselves to me after studying the patent.

X Q. 49. And I presume also after you had made a study of the

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other and subsequent patents in this art, including the patent in suit, or did you study the Johnson patent before you studied the patent in suit?

A. The mechanism described by me as being such as might be employed to carry out the process described in the Johnson patent, occurred to me without any conscious reference to the patent in suit or any other of the patents in this art. The mechanism described does not differ materially from that of an ordinary sheet metal shear except that the vertically reciprocal member is not used to cut off a piece of metal but to engage the portions already slit. Such mechanism is sufficiently common in the art and obvious to one skilled in the art that it might readily be conceived of even without any knowledge at all of any of the patents referred to in this particular art.

X Q. 50. I do not care for what you think might have been done. Do you mean to testify that you evolve this method of making expanded metal out of the Johnson British patent before you had read the patent in suit?

I ask for an answer "yes" or "no?"

A. I evolved the said mechanism described in my answer to cross-question 47 after hearing said question asked. Consequently it was naturally after having read all the patents referred to in my direct testimony, but as I have stated it was without any conscious reference to any of said patents in my mind.

Adjourned to Wednesday, September 7th, 1904, at 10.30 A. M.

WEDNESDAY, *September* 7, 1904, 10.30 a. m.

Met pursuant to adjournment.

224 Present as before.

Cross-examination of Mr. COOMBS resumed.

By Mr. HUNTER:

X Q. 51. Will you now point out the particular words in Johnson's specification, which, in your opinion, authorize or justify the method or process of forming the meshes described in your answer to X Q. 47?

A. The language of the specification of the Johnson patent from which I formed the conception of mechanism described in my answer to said X Q. 47 is simply the statement found in line 10, etc., namely, "the plate is then pulled in a direction or directions transversely to the length of the slits or slots and over a suitable former or mould if desired and thus produce an open metal work."

X Q. 52. What do you understand to be meant by "In a direction or directions transversely to the length of the slits or slots?"

A. By the language quoted I understand is meant a direction substantially at right angles to the direction of the slots.

X Q. 53. Would not that direction be more correctly described as transversely to the plane of the sheet or transversely to the edge of the cuts?

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A. I do not think that the expressions "transversely to the plane of the sheet" and "transversely to the edge of the cuts" are synonymous. I believe that the language quoted by you in X Q. 52 means at right angles to the direction of the slots and in the plane of the sheet.

X Q. 54. A direction substantially at right angles to the direction of the slot might be either in the plane of the sheet or transversely to the plane of the sheet, might it not?

A. It might.

X Q. 55. Then the direction in which you would pull the metal
to open up the slots in the manner described by you in your
225 answer to X Q. 47 would be in a direction or directions transversely to the length of the slits or slots and transversely to the plane of the sheet?

A. That is correct.

X Q. 56. And the specification of Johnson's patent does not contain, does it, any reference to a pulling in a direction transversely to the plane of the sheet?

A. The specification of the Johnson patent states that the slit sheet is opened by a pulling or stretching force applied "transversely to the direction of the slits" and does not say whether or not the same is transversely to the plane of the sheet.

X Q. 57. But in the only mechanism described in the patent for performing this pulling or stretching operation, to wit: that described in lines 37 to 40, the stretching or pulling is in a direction transversely to the length of the slit and in the plane of the sheet and not in a direction transversely to the plane of the sheet; is not that true?

A. I do not find in the Johnson specification any definite statement as to the application of the stretching force other than that quoted in my last answer. Such a force would be "transversely to the length of the slits" whether applied in the plane of the sheet or at right angles thereto as you have suggested in X Q. 55.

X Q. 58. Now will you please answer my question which I will ask you to read?

A. The specification does not state that the pulling force is applied "in the plane of the sheet." It simply states that it is transversely to the direction of the slits.

X Q. 59. I must insist on an answer to my X Q. 57., which I again repeat. It is a simple question and can be answered "yes" or "no."

A. I do not find anywhere in the specification of the Johnson patent a statement that the pulling or opening force is applied in the plane of the sheet.

X Q. 60. That is manifestly not an answer to my ques-
226 tion. Are you unable to answer it "yes" or "no?"

A. Your question refers to lines 37 to 40 of the specification of Johnson. As I have stated therein a statement that the pulling is transversely to the length of the slits, but I do not find any statement that it is transversely to the plane of the sheet. This is the best answer to your question which I am able to give.

X Q. 61. You have probably overlooked the fact that in lines 32 and 33 of page 2 of the Johnson specification, it is stated that the sheet is "pulled or stretched in the direction of the arrows *d, d,* that is to say, transversely to the direction of the slit." Now will you please again refer to the Johnson patent and to Figs. 1 and 3, and state whether a pulling in the direction of the arrows *d, d,* is not in a direction in the plane of the sheet, and not transversely thereto?

A. In my preceding answers I have had in mind the statement referred to, namely, that the pulling force is applied in the direction of the arrows *d.* These arrows indicate a direction lying primarily in the plane of the blank sheet, that is to say, that is the direction in which the force would be first applied, but inasmuch as a slit sheet of the kind illustrated in Fig. 1, does not remain in its original plane during the expanding operation, the direction of the forces might, and in my opinion, probably would, leave the plane of the sheet.

X Q. 62. Now if the sheet shown in Fig. 1 were stretched or pulled out in the direction of the arrows *d, d,* that is to say, transversely to the direction of the slit and in the plane of the sheet, would it not result that the resulting sheet of expanded metal would necessarily be of shorter length than the original blank?

A. If the pulling or opening up of the sheet of Fig. 1 were performed by means applied to the opposite edges thereof without any other means such as that referred to by me in my answer
227 to X Q. 47, the sheet would undoubtedly be shortened during the process of expansion.

X Q. 63. In your direct testimony in referring to the Golding patent in answer to Question 6, you referred to the fact that the patent on its face is described as being but a mere "Improvement." Do you not as a former Examiner of the Patent Office know that all Letters Patent are described as "improvements?"

A. I do not know that all Letters Patent are so described, but I do know that it is customary to use the word "improvement" in the formal parts of applications for patents.

X Q. 64. It is a fact, is it not, that in the printed grant of all patents issued by the United States Patent Office the invention is described as a "new and useful improvement in ——?"

A. It is.

X Q. 65. Of all of the patents of the prior art to which you have referred in your deposition, which one, in your opinion most closely approaches complainant's patent in suit?

A. I think that both the British patents referred to and the Golding 1884 patent disclose equally well the steps positively enumerated in the claim of the patent in suit, that is the simultaneous slitting and bending of a metal plate and the subsequent slitting and bending the same in places alternate to the first mentioned portion. No one of these patents states in so many words that the portions joining the unslit parts of the sheet are stretched or elongated, but that as I have stated in my direct testimony, seems to me to be a question of degree. The claim of the patent in suit reads also exactly on the method disclosed in the patent to Ohl, 475,700.

X Q. 66. Is is not a fact that each of the British patents referred

to, and also the Golding 1884 patent instead of showing the sim
taneous slitting and bending of a metal plate shows a previous sl
ting of each plate throughout the entire surface and a su
228 sequent bending or opening up of the meshes?

A. I believe that to be the method employed in each
the patents referred to.

X Q. 67. Then why in your last answer did you make the m
statement that these patents show the simultaneous slitting a
bending?

A. In my said answer I should have omitted the word "simulta
ous." Whether these two operations are performed at the same ti
or consecutively did not appear to me to be material, since as w
stated in the specification of the patent in suit it was old long pr
to the date thereof, to perform said operations simultaneously a
as shown by the British patents under consideration, *inter alia*,
was old to perform these operations consecutively.

X Q. 68. But the simultaneous bending and slitting is absolut
essential to the complainant's patent in suit and is made an essent
of the claim, is that so?

A. It is essential to the manufacture of expanded metal of
kind shown and described, I believe, that the slitting and bendi
or opening should be simultaneously performed, but that as I und
stand it, was not novel at the time at which the application for
patent in suit was filed.

X Q. 69. Now in view of the fact that the two British pate
and the Golding 1884 patent do not disclose a simultaneous slitti
and bending, irrespective of whether there is any stretchi
and that such simultaneous slitting and bending, with a stretchi
of the strand, is essential to the commercial production of the
panded metal described in the complainant's patent, and is ma
an element of the claim, are you still of the opinion that these t
British patents and the Golding 1884 patent, are the best ref
ences to the patent in suit, and do you think you would still c
sider them so if you were an Examiner in the United States Pat
Office?

229 A. Admitting that the two British patents and the Go
ing 1884 patent do not disclose the simultaneous slitting a
bending of the sheet, I still consider them to contain a sufficient d
closure to enable one skilled in the art to produce expanded me
of the type shown and described in the patent in suit.

X Q. 70. Do you consider these patents closer than the Ohl 18
patent?

A. I think that the claim of the patent in suit is met "in ter
by the Ohl patent, but inasmuch as the article made by the machi
of said patent is a different kind of expanded metal from t
made by the method of the patent in suit, I am inclined to consi
the two British patents referred to, and the Golding 1884 pat
as best illustrating the prior art in the manufacture of this particu
kind of expanded metal.

X Q. 71. Will you please define "expanded metal" as that te
is used in the art?

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A. By that term is meant, as I understand it, metal sheets or plates in which incisions or apertures have been formed without the removal of any metal, by which I mean, that the portions separated by said incisions or apertures remain attached to the plate, the object being to afford holding means for plaster and the like. One form of such expanded metal is shown in the patent to Ohl, and other forms in the British patents and the other patents referred to by me in my direct testimony.

X Q. 72. Then you consider expanded metal to be the same as punched or stamped metal lathing?

A. I think that such lathing as is shown in the said patent to Ohl would properly come under the generic term of "expanded metal," although I realize that in a more restricted sense it would be limited to a plate of metal which had been subjected to a stretching operation so that it became of greater area than its original area.

X Q. 73. In this sense, would you consider the following as a correct definition of expanded metal:

230 "A unitary reticulated or open meshed sheet formed by expanding a sheet of metal into a greater area than the original blank?"

A. I should consider that a correct definition of the term when used in the more restricted sense referred to.

X Q. 74. Have you, excepting in connection with the particular exigencies of this case, ever heard the term "expanded metal" applied to any other form of metal than that described in the foregoing definition?

A. Only in connection with my former occupation as an Examiner in the Patent Office, where a considerable number of patents were gathered together under the title of "expanded metal making," which number included, as I recall it, methods for making lathing, stamped or punched like the lathing shown in Figs. 10 and 11 of the Ohl patent, as well as machines and methods for making lathing of the kind shown in the Golding 1884 patent, etc.

X Q. 75. Do you mean by that that for convenience of examination in the Patent Office, the Examiners gathered together patents of the kind you have specified and classified them under the head of "expanded metal making?"

A. Yes, sir; that was the case at the time I had charge of the classes mentioned by me in my prior answer.

X Q. 76. In Ohl's 1892 patent the finished sheet of metal lathing is not stretched out or expanded to a larger area than the original blank, is it?

A. No, sir; it is not.

X Q. 77. And in the Ohl metal lathing, there is between each row of punched strips a continuous unpunched and uncut strip of metal extending from end to end of the sheet and of a width equal to the width of the punched strips?

A. That is correct.

X Q. 78. Have you ever seen a machine of the character described in the Golding & Durkee 1888 patent in operation?

231 A. No, sir; I have not.

X Q. 79. Have you ever examined any of the metal made in accordance with the process described in that patent?

A. I have seen and examined samples of expanded metal which I believed were made by the method described in said patent.

X Q. 80. In the process described in the Golding & Durkee patent, what is there to prevent the opening up of the mesh under the action of the cutter without stretching or elongation of the strands?

A. If you refer in your question to the Golding & Durkee patent of 1888, I do not find therein anything to prevent the opening up of the strands. On the contrary it seems to be the object of the machine to provide means for that purpose.

X Q. 81. It is a fact, is it not, that the expanded metal made by defendant's machine is made by simultaneous slitting and bending portions of a plate or sheet of metal in such manner as to stretch or elongate the bars connecting the slit portion and body of the sheet or plate, and then similarly slitting and bending in places alternate to the first mentioned portion, thus producing a finished expanded sheet metal of substantially the same length as that of the original sheet or plate?

A. The defendants' machine takes a blank sheet of metal and performs upon it the steps specified in your question, producing a sheet of expanded metal somewhat longer than the blank from which it is made.

X Q. 82. And according to the testimony which has been given in this case the amount of elongation is from less than three-tenths to less than seven-tenths of one per cent. of the length of the sheet?

A. Those are I believe substantially the correct figures.

X Q. 83. As early as 1893 means for feeding sheet metal in machines for making expanded metal were well known in the art? 232

A. Yes, sir.

X Q. 84. And also devices for reciprocating cutters?

A. Yes, sir.

Cross-examination closed.

Redirect examination.

By Mr. Jackson:

Recess.

Complainants' counsel waives notice of Long's British patent 2125, of 1862, dated July 26, 1862, and of the Golding & Durke patent, No. 381,230, dated April 17, 1888, and withdraws the objections heretofore entered with reference to the competency of any testimony thereto by reason of failure to set up the said patents in the answer, and agrees that the said patents and the testimony with reference thereto so far as relevant and material may be considered with the same force and effect as if the said patents had been pleaded in the answer.

R. D. Q. 85. Looking now at the British patent to Johnson, to which reference has been made frequently in the cross-examination

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please state what, in your judgment, that patent would disclose to the ordinary skilled mechanic at the time of the application date of the patent in suit?

(Objected to as the patent is the best evidence of what it discloses.)

A. The disclosure contained in the specification of the British patent to Johnson seems to me to be an amply sufficient one, the description being taken in connection with the drawings, to enable a mechanic or other person familiar with the art of sheet metal working to construct expanded metal as illustrated in Fig. 2 of said patent from blank sheet illustrated in Fig. 1. The very reason 233 that the patentee did not go into greater detail in describing the apparatus to be employed is, I take it, owing to the fact that the construction and mode of use of such apparatus was considered to be obvious to persons skilled in the art at that time, namely, 1885. If this were not so, I think that the British Patent Office would have required further description and illustration of the means to be employed.

R. D. Q. 86. You have referred to Figs. 1 and 2 of the Johnson patent and to the connection of the drawings with the disclosure in the patent; state what, if any, disclosure is made by these figures.

(Same objection.)

A. Figure 1 of the Johnson patent shows a blank sheet of metal which has been slitted or slotted in parallel rows, the sets of one row breaking joint of those of the next row. Figure 2 shows the same sheet, or rather a portion of the same, the whole sheet not being shown because it would be unnecessary and take up too much room on the drawing, after the expanding operation. The drawing was evidently carefully made to scale, and the expanded sheet in Fig. 2 is shown as being of exactly the same length as the blank sheet in Fig. 1. It would, therefore, it seems to me, be obvious to a mechanic or other person skilled in metal working, that the strips or strands of metal which unite the uncut portions of the sheet must be somewhat stretched or elongated in order that the finished sheet may retain the length of the blank sheet. In reading this patent and considering the drawing the question as to how the length of the sheet would be maintained would naturally suggest itself to a mechanic in my opinion.

R. D. Q. 87. Is there, or is there not, anything in the specification of this British patent which would answer this question, which you state would naturally occur to the mechanic?

A. The following language in the specification answers the question referred to:

234 "Fig 1 represents a metal sheet having longitudinal parallel slits formed therein ready to be stretched or pulled and opened out, and Fig. 2 represents the *same sheet* after it has been stretched or pulled and opened out."

R. D. Q. 88. In the latter part of answer 85 you make reference to the British Patent Office requiring further description, etc.; state

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whether or no it is the practice of a British Patent Office to re
further description where that furnished is regarded as insuffic

A. I understand the duties of the Examiners in the British
ent Office to be to pass upon the question of whether or not th
plications filed comprise a complete disclosure of the invention w
the applicant desires to patent, that is to say, to decide whethe
description of the invention is sufficiently clear to enable pe
skilled in the art to which the invention appertains, to mak
use the same without the exercise of any further inventive act.
do not pass upon the question of novelty, as I believe, and ther
their only duties are as I have stated, to see that the inventi
fully and clearly described and illustrated.

R. D. Q. 89. I direct your attention to British patent to Long
which also there has been cross-examination, and ask you to
what in your judgment would be disclosed thereby to one fan
with the art in question as a skilled mechanic in that art, at the
the patentee of the patent in suit filed the application for that
ent?

A. The specification of the British patent inquired about disc
clearly a method of making expanded metal consisting in sli
a blank sheet in rows breaking joint with each other, and
stretching or opening out the same to make a "trellis having
gonal openings." This method is the same as that disclosed i
Golding patent, No. 297,382, which was declared invalid in
of said British patent by Judge Sanborn in his decisio
235 ferred to by me in my direct testimony. In neither
ent is the means to be employed to stretch or open ou
sheet described in any detail owing, I should say, to the fact
the patentees considered that the means to be employed woul
obvious or naturally suggest themselves to persons skilled in th

R. D. Q. 90. In answer to X Q. 67 you state that the specific
of the patent in suit "stated" that

"it was old long prior to the date thereof, to perform said opera
simultaneously."

Please state your authority for this portion of X Q. answer 67?

A. My best authority for that statement is found in the spec
tion itself of the patent in suit in the following words, line 15 *et*
of page 1:

"It" ('what is now generally known as expanded sheet me
"has also been made by simultaneously cutting and opening
metal by means of cutters set off or stepped relatively so as to
the slashes or cuts in different lines in the manner set off in p
No. 381,230 or No. 381,231, of April 17, 1888."

R. D. Q. 91. State what, if any, effect this prior "simultane
step in the art would have upon the ordinary skilled mech
skilled in this art, who at the time of filing the application in
read any one or all of the three patents, British patents to Joh
and Long and United States patent to Golding, variously c
"Golding patent of 1884" and "Golding patent No. 297,382?"

(Objected to as manifestly incompetent, the best evidence of

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effect the disclosures of the patents referred to would have upon persons skilled in the art, is what such persons actually did do having such disclosures before them. The opinion of the witness upon the subject is therefore absolutely worthless as evidence.)

A. In my opinion, the step of "simultaneously cutting and opening the metal" was clearly described in patents Nos. 381,230
236 and 381,231 long prior to the filing of the application on which the patent in suit was granted, and that therefore there was at the time of filing said application no novelty in said step *per se*.

R. D. Q. 92. You appear to have overlooked a portion of the question, and I would ask you to reread the same.

(Objection repeated.)

A. My answer to that would be that a skilled mechanic knowing of the "simultaneous" step and having read anyone or all of the three patents mentioned in the question would know that the blank sheets might be either first slit and then opened or simultaneously slit and opened and that it would be a matter of choice or judgment as to which method he would employ.

R. D. Q. 93. Compare the particularity of disclosure when the details thereof is to form the foundation of a claim with that necessary for other parts of the specification, in order to support an United States patent?

A. That part of the specification which describes the elements of a combination upon which combination a claim is based must necessarily be set forth in detail and with clearness. The same is true of the steps of a method upon which a claim is based. A specification, however, will often contain a description of mechanism or methods which are used to produce the article or machine, or which is used in practicing the method claimed, and such parts or steps are not required to be described in detail as they do not constitute an essential part of the invention, and are supposed to be familiar to persons skilled in the art to which the invention relates.

Redirect examination closed.

Re-cross examination.

By Mr. Hunter:

R. X Q. 94. Have you intended by any of your answers on your redirect examination with reference to Long's British provisional specification and Johnson's British patent, to modify
237 or change any of the testimony you have given with reference to those patents or publications on your cross-examination?

A. No, sir; I have not.

R. X Q. 95. What reason have you for saying that the drawing of Johnson's British patent was evidently carefully made to scale?

A. I judge that it was so made from the fact that the opened out sheet of Fig. 2 is shown of precisely the same length as the blank sheet of Fig. 1, and from the fact that the slots and meshes in said figures are of uniform dimensions.

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R. X Q. 96. Can you cite any patent, prior to the Golding patent in suit, which describes the elongation of strands in a sheet of expanded metal, and by expanded metal I mean expanded metal and not punched sheets used for metallic lathing?

A. Giving to the term "expanded metal" the limited meaning mentioned by you, I am unable to cite any patent prior to the Golding patent in suit which states, in so many words, that the strands are stretched or elongated in themselves.

R. X Q. 97. You have attempted to explain the practice of the British Patent Office in the examination of specifications; is the following, which I quote from Reginald Haddon's Inventors' Adviser, 4th Ed., 1898, page 162, in your opinion a correct statement of the practice?

"The application is referred by the Comptroller of Patents to an Examiner to ascertain and report whether the nature of an invention has been fairly described, and the application, specification and drawings (if any) have been prepared in the prescribed manner and the title sufficiently indicates the subject matter of the invention.

" This examination must necessarily be very incomplete since the
Examiner can only judge of the invention as described in
738 the specification, and has no certain means of knowing
whether it is sufficient and correct or not."

A. The quotation from Mr. Haddon's book is undoubtedly a correct description of the practice of the British Patent Office in his opinion. It means, however, just what I have previously stated, namely that the Examiners have to decide whether the showing and disclosure of an invention is sufficient to enable a person skilled in the art to make and use the same.

Recross-examination closed.

HOWARD A. COOMBS.

Examiner's certificate attached to original deposition.

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7 Sheets—Sheet 1.

(No Model.)

J. F. GOLDING.

MACHINE FOR MAKING EXPANDED METAL.

No. 581,713. Patented May 4, 1897.

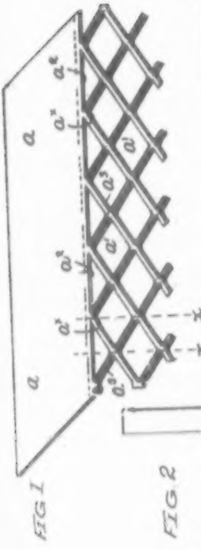
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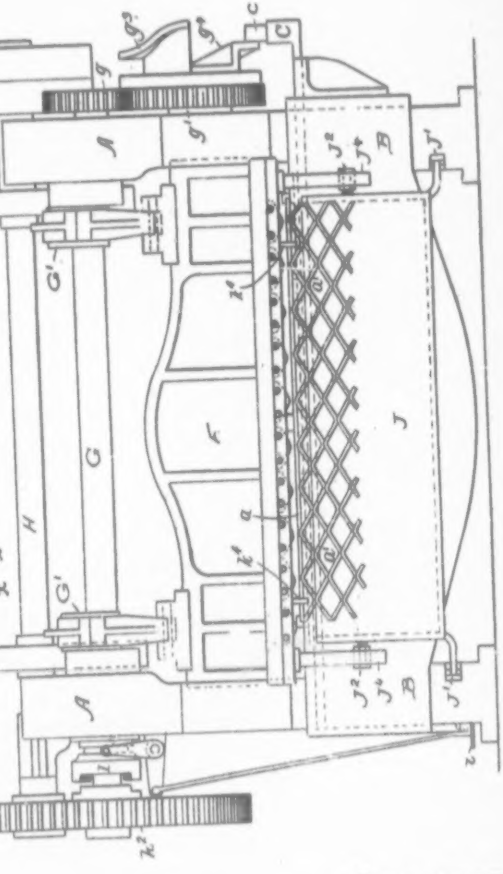
FIG 1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g³
k²
k⁴
a
a'
1
2

FIG. 2

WITNESSES:
Sav. C. Curtis
H. M. Munday

INVENTOR:
JOHN F. GOLDING
BY Munday, Evarts & Adcock,
HIS ATTORNEYS.

159

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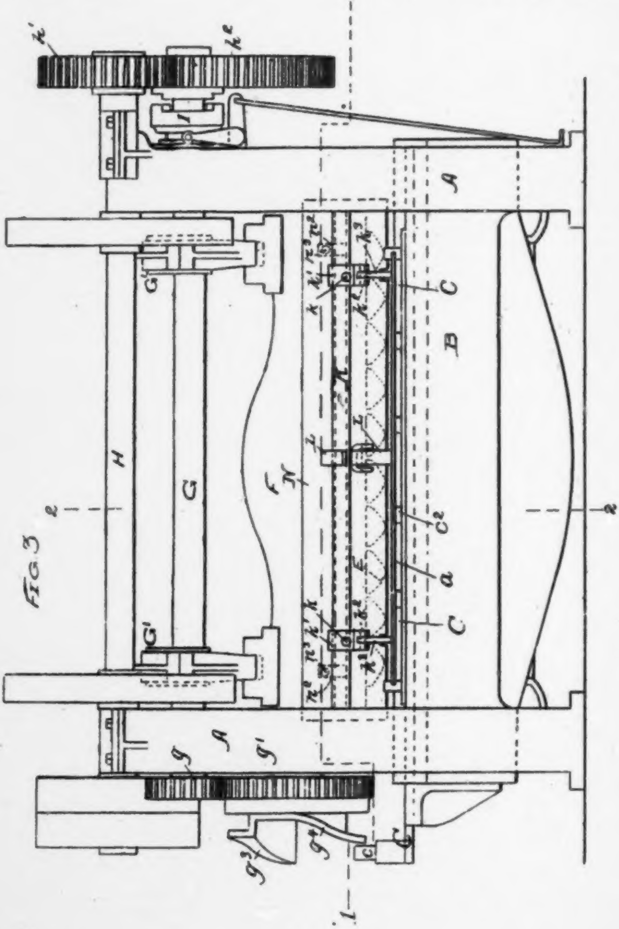
(No Model.) 7 Sheets—Sheet 2.

J. F. GOLDING.

MACHINE FOR MAKING EXPANDED METAL.

No. 581,713. Patented May 4, 1897.



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2
g
g'
g³
g⁴
c
C
1

Fig. 3

WITNESSES:

Geo. C. Curtis

H. M. Munday

INVENTOR:

JOHN F. GOLDING

BY Munday, Evarts & Adcock.

HIS ATTORNEYS

161

244

(No Model.)

7 Sheets—Sheet 3.

J. F. GOLDING.

MACHINE FOR MAKING EXPANDED METAL.

No. 581,713. Patented May 4, 1897.

FIG. 4.

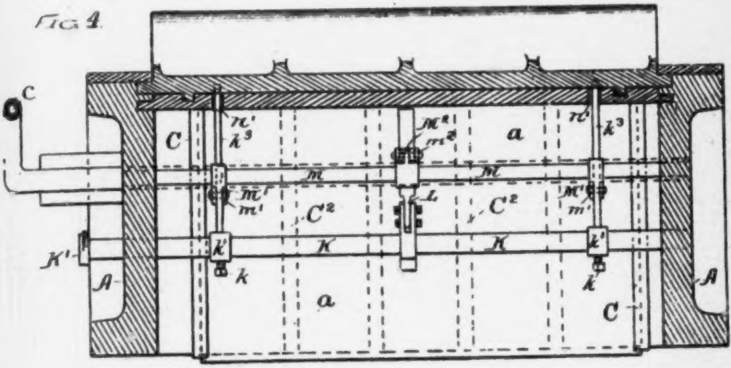
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FIG. 9.

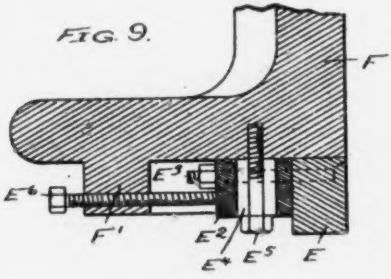
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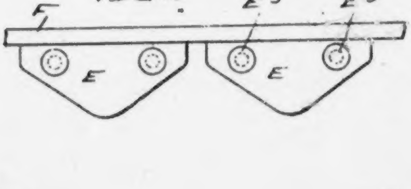
FIG. 10



WITNESSES:
Lew. E. Curtis
A. W. Munday

INVENTOR:
JOHN F. GOLDING
BY Munday, Evarts & Adcock
HIS ATTORNI

(No Model.)

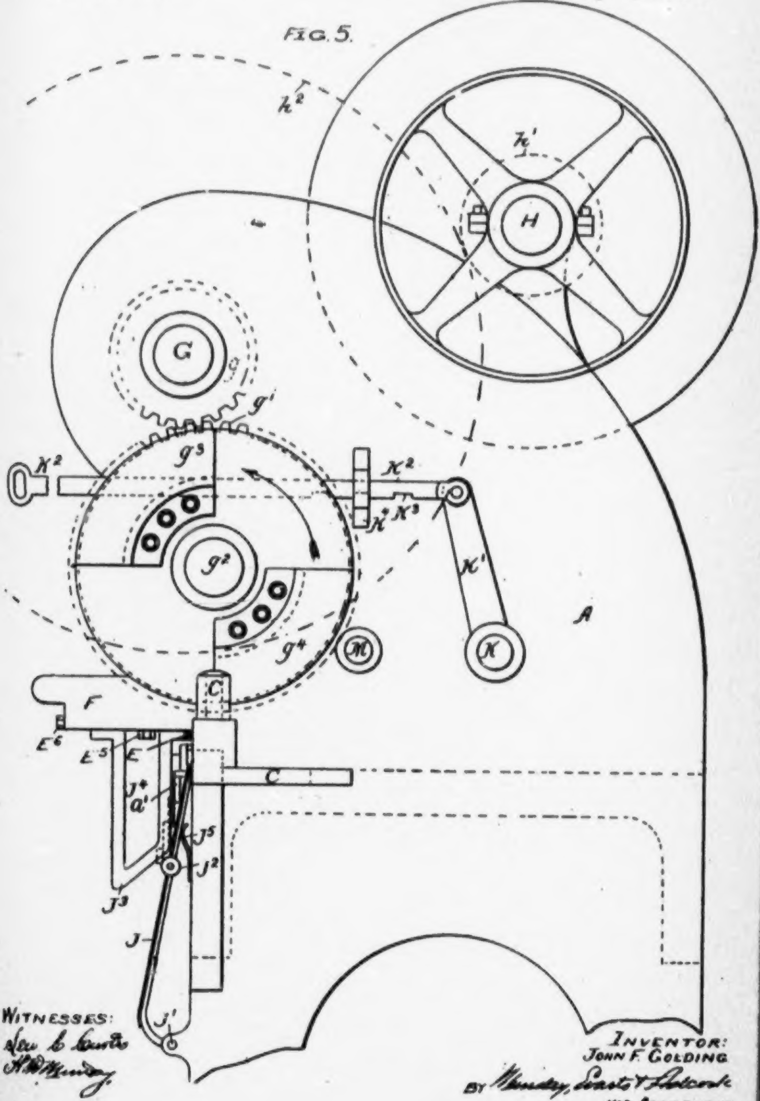
7 Sheets—Sheet 4.

J. F. GOLDING.

MACHINE FOR MAKING EXPANDED METAL.

No. 581,713. Patented May 4, 1897.

FIG. 5.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K
C
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E⁵
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J⁴
a'
J⁵
J²
J³
J
J'
C

WITNESSES:
Lew C. Curtis
H. M. Munday

INVENTOR:
JOHN F. GOLDING
BY Munday, Evarts & Adcock
HIS ATTORNEYS.

163

248

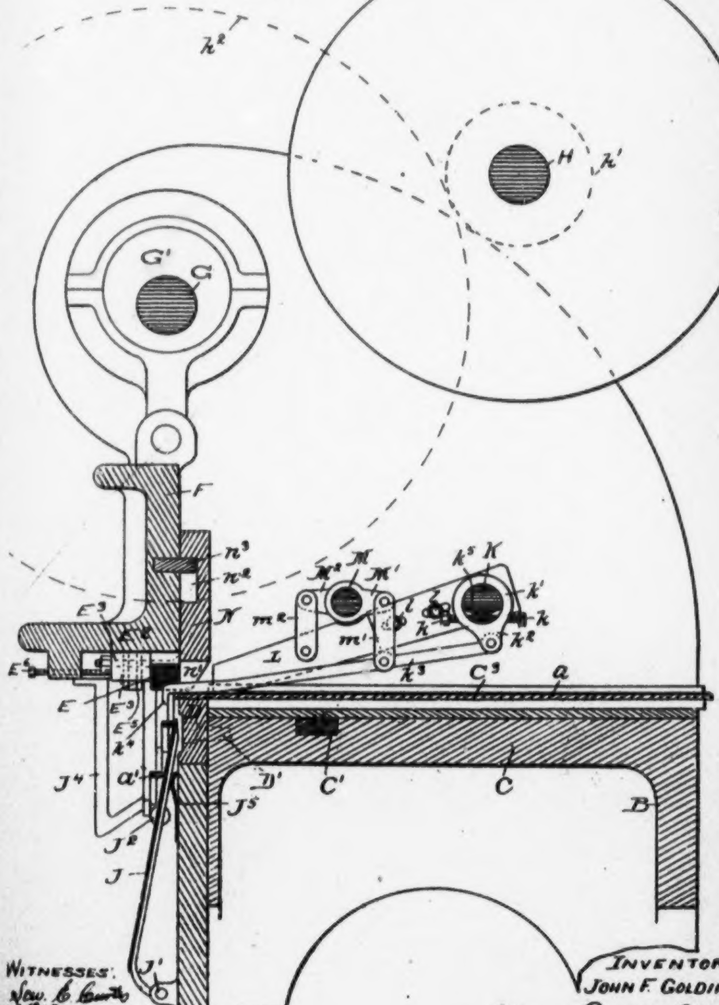
(No Model.) 7 Sheets—Sheet 5.

J. F. GOLDING.

MACHINE FOR MAKING EXPANDED METAL.

No. 581,713. Patented May 4, 1897.

FIG 6



k²
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k'
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n²
N
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E²
E⁶
E
E³
E⁵
k⁴
J⁴
a'
J²
J
J'
n⁴
D
D'
C'
C
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C³
a
k³
M²
M
M'
m²
I
m'
l
k
k⁵
K
k'
k
k²

WITNESSES:

INVENTOR:
JOHN F. GOLDING
BY Munday, Evarts & Adcock.
HIS ATTORNEYS.

164

250

(No Model.)

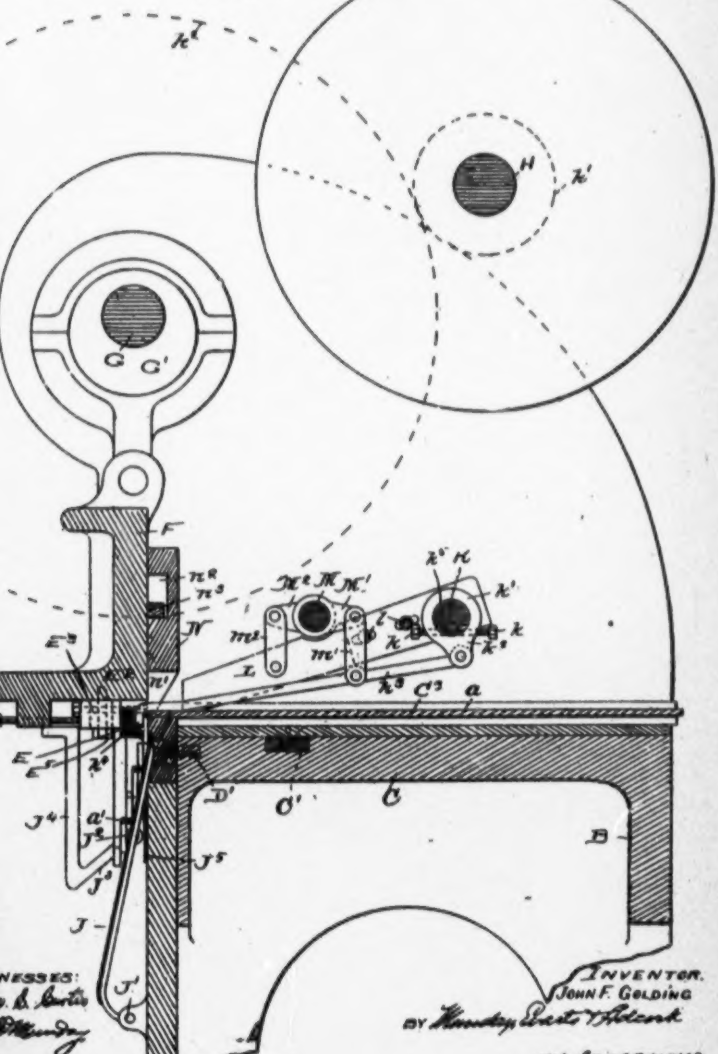
7 Sheets—Sheet 6.

J. F. GOLDING.

MACHINE FOR MAKING EXPANDED METAL.

No. 581,713. Patented May 4, 1897.

FIG. 7.



k7
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n'
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D'
C'
C
B
J4
a'
J2
J3
J5
J
J'

NESSES:

INVENTOR.
JOHN F. GOLDING
BY Munday, Evarts & Adcock
HIS ATTORNEYS

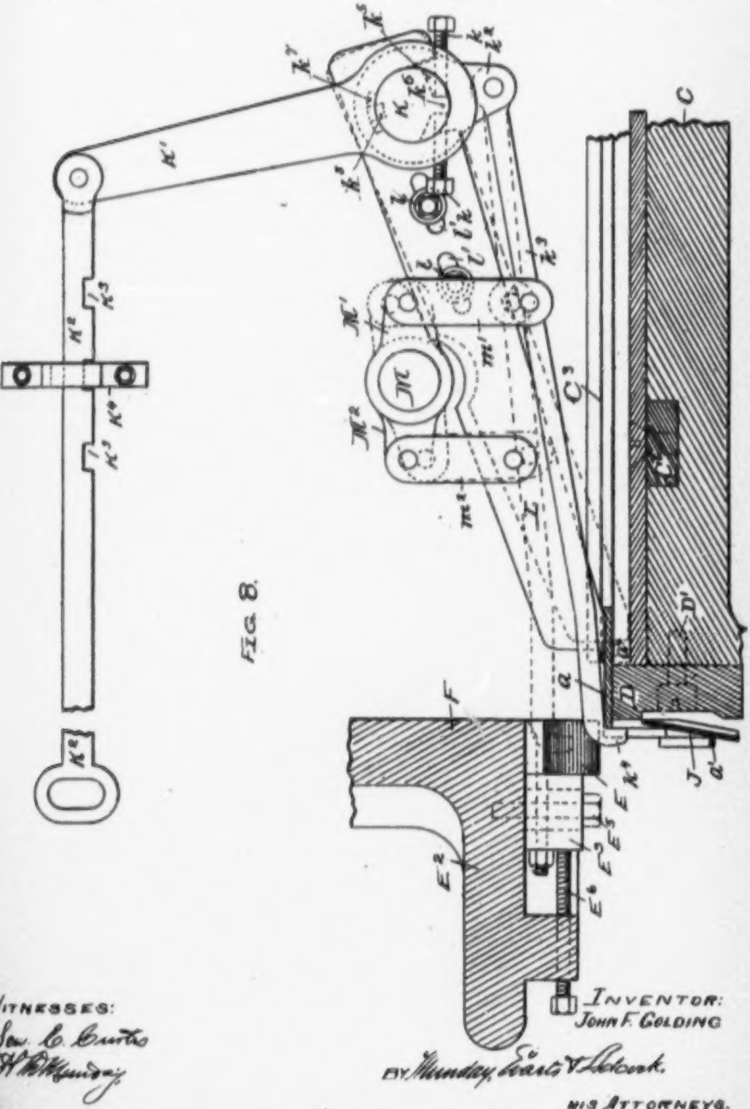
165
252

(No Model.) 7 Sheets—Sheet 7.

J. F. GOLDING.

MACHINE FOR MAKING EXPANDED METAL.

No. 581,713. Patented May 4, 1897.


K7
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k
k2
K
K6
f
C
K1
K8
l
l1
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l1
K3
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C2
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a
a
D
K9
E
J
a1
E2
E3
E5
E6
K2

FIG. 8.

ITNESSES:
Geo. C. Curtis
H W Munday

INVENTOR:
JOHN F. GOLDING

BY Munday, Evarts & Adcock.
HIS ATTORNEYS.

UNITED STATES PATENT OFFICE.

JOHN F. GOLDING, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE EXPANDED METAL COMPANY, OF SAME PLACE.

MACHINE FOR MAKING EXPANDED METAL.

SPECIFICATION forming part of Letters Patent No. 581,713, dated May 4, 1897.
Application filed May 20, 1896. Serial No. 592,254. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. GOLDING, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Machines for Making Expanded Metal, of which the following is a specification.

This invention relates to improvements in machines for the manufacture of open or reticulated metal-work of the kind commonly known as "expanded sheet metal" or metallic trellis-work.

According to my improved machine the meshes of the expanded sheet metal are produced by cutting a series or row of slits and simultaneously with such cutting operation opening the slits mainly by stretching the strips or strands of metal in contiguity to the aforesaid slits, this stretching operation being effected by stretching the strips or strands downward in a direction approximately at right angles to the plane of the sheet.

It is an essential feature in my present machine that the meshes in the sheet metal are produced by stretching instead of by simply bending the aforesaid strips or strands, as heretofore.

In carrying my invention into practice I cut the series of slits in a straight line parallel to the edge of the metal sheet by means of knives, one of which is stationary and has a plain cutting edge, while the other is capable of reciprocating up and down and has a cutting edge of sinuous form. The reciprocating knife may be shifted laterally after each operation and the metal sheet be at the same time fed forward the proper distance to receive a fresh series of slits opposite the portions unsevered at the previous operation, or the said sheet may itself be shifted laterally instead of the knife.

In order that my invention may be clearly understood and readily carried into effect, I will proceed to describe the same more fully with reference to the accompanying drawings.

Figure 1 is a perspective view of a metal sheet a portion of which has been expanded or formed into trellis-work by my machine. Fig. 2 is a front elevation of the machine. Fig. 3 is a rear elevation thereof. Fig. 4 is a horizontal section of the machine, taken on the line 1 1 of Fig. 3. Fig. 5 is an end view of the machine as seen from the right of Fig. 2. Fig. 6 is a transverse section taken on the line 2 2 of Fig. 3 and as seen from the left; and Fig. 7 is a similar section, but shows the parts in another position. Figs. 8, 9, and 10 illustrate details which will be hereinafter more fully described. Figs. 5 to 10 are drawn on an enlarged scale in order that the parts may be more clearly seen.

Referring first to Fig. 1, a is a metal sheet from which the meshes a' have been produced by the improved machine. a^2 a^2 are the slits or incisions which are cut in a straight line near the front edge of the metal sheet, and a^3 a^3 are the strips or strands of metal as they appear after being stretched by the pressure of the sinuous edge of the upper or reciprocating knife acting thereon during its downward stroke. The act of stretching the series of strips or strands a^3 in this way produces a row of triangular meshes or semimeshes adjacent to the edge of the metal sheet. After the formation of these semimeshes the metal sheet is shifted laterally for a distance equal to the space between the vertical lines x x, that is to say, a distance equal to half a mesh. The metal sheet is then also fed forward a distance equal to the width of the strips or strands a^3. The reciprocating knife then again descends and produces a second row of semimeshes immediately above the row produced at the previous operation. A row of complete meshes of lozenge shape is thus formed. The metal sheet is then again shifted laterally, but in the opposite direction to its former lateral movement, and is also again fed forward. The metal sheet is then ready to be once more acted upon by the knives in forming another row of semimeshes above the previous row in the manner already stated.

Referring now to Figs. 2 to 10, A A are end standards rigidly connected together near their lower ends by a strong frame B, the upper portion of which serves as a support to receive a laterally-reciprocating table C for the metal sheet or blank a. D is the plain-edged knife, which is secured to the front edge of the table C by screws D'. E is the sinuous-edged knife, which is composed of a number of separate cutters having spaces between them. These cutters are carried by a reciprocating head F, which receives a rectilinear up-and-down movement from eccentrics G' G', mounted on a shaft G, that is driven from a counter-shaft H by means of suitable toothed wheels h' h^2. I is a clutch which can be operated from a treadle i for throwing the said shaft G into or out of gear with the aforesaid toothed wheels h' h^2. g is a toothed pinion which is keyed to one end of the shaft G and gears with a toothed wheel g', mounted on a stud g^2, projecting from the outer face of the end frame of the machine. This wheel g' is provided with two cam-pieces g^3 g^4, which are so shaped that when the machine is working they give a lateral movement to the before-mentioned table C first in one direction and then in the other, with a pause between each movement, by acting on a roller c, carried by a pin projected upwardly from one end of the table. On the under side of the said table is a fillet c', which works in a groove in the frame B and guides the table during its movements. The surface of the table is provided with a series of transverse bars c^2, upon which the under side of the metal sheet a rests, and the two outermost of these bars are formed with grooves c^3, into which the end edges of the sheet enter and by which the said sheet is guided as it is fed from rear to front of the machine.

The feeding of the sheet is effected by a frame or flap J, which is pivotally connected at J' to the end standards A of the machine and is provided with a roller J^2 at each end. These rollers are so situated that they can be acted upon by inclines J^3, formed on brackets J^4, bolted to the under side of the head F. As this head descends to bring its knives E onto the metal sheet the aforesaid inclines J^3 come against the rollers J^2 and by acting thereon cause the frame J to turn inwardly about its pivots and its upper edge to enter recesses formed therefor in the stationary knife D. (See Fig. 6.) J^5 are springs which act to return the frame to its outward position when the head F and its inclines J^3 rise. The said frame thus receives an oscillatory movement during the rise and fall of the head F, and each time it performs a forward stroke it presses against the meshes a' of the expanded sheet metal in front of it, and thereby causes the sheet to advance a certain distance, ready to be acted upon at the next downstroke of the upper knives E. In order to limit the extent of this forward stroke of the said frame, and thereby regulate the feeding of the metal sheet through the machine, I provide a rocking shaft K, which is furnished at one end with a lever K', whose outer end is pivotally connected to a movable bar K^2, having a series of notches K^3 in its lower edge, Fig. 8. This notched bar K^2 is situated within easy reach of the machine attendant, so that he can shift the said bar in either direction and retain it in such shifted position by bringing one or other of its notches into engagement with the bracket K^4, in which the said bar slides. Secured to the aforesaid rocking shaft K by set-screws k are sleeves k', having lugs k^2, to which are pivotally connected arms k^3, having bent outer ends or fingers k^4, which normally lie in a stationary position in advance of the front edge of the metal sheet a. These fingers serve to limit the extent to which the said sheet can move forward when acted upon by the before-mentioned frame J. By shifting the notched bar K^2 the rocking shaft K and therefore the arms k^3 can likewise be shifted to bring the aforesaid fingers k^4 nearer to or farther from the edge of the metal sheet under operation. For the purpose of effecting a fine adjustment of the position of the said fingers relatively to the front edge of the metal sheet the rocking shaft K is formed with inclined recesses k^5, into which the inner ends of the set-screws k enter and bear upon the metal portion k^6, existing between the bottoms of these recesses. (See Fig. 8.) The said sleeves are also formed with segmental slots k^7 for the reception of feathers k^8 on the rocking shaft. By turning the set-screws in one or other direction the position of the aforesaid fingers k^4 on the arms k^3 can be adjusted independently of the rocking shaft K.

The means hereinbefore described for controlling the feed of the metal sheet also enable any required width of the expanded metal to be severed from the said sheet. This is effected by merely drawing the notched bar K^2 outward a sufficient distance to cause the fingers k^4 to move inwardly and restore the metal sheet to the position it occupied prior to its preceding feeding movement. This retraction of the metal sheet does not, however, interfere with its lateral movement. Consequently when the upper knives E next descend they act upon the metal existing between and in alinement with the previous line of incisions, thereby completely severing the expanded metal from the sheet a. The notched bar K^2 is then returned to its original position, and the machine will continue working as before.

Mounted loosely on the before-mentioned rocking shaft K, so as not to turn therewith, is an arm L, which is situated approximately midway between the sleeves k'. The free end of this arm rests by its own weight upon the metal sheet that is being operated upon in the machine. Situated above the said arm L is a rocking shaft M, having thereon levers or lugs M' and M^2, which project in opposite directions. The lugs M' are pivotally connected by links m' to the aforesaid arms k^3, and the lug M^2 is pivotally connected to the arm L by links m^2. (See Figs. 4 and 8.) So long as the free end of the arm L rests upon the metal sheet passing through the machine, the parts just above mentioned remain in the position represented by the full lines in Fig. 8; but when the rear edge of the metal sheet

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onger act to retard its forward move-
The metal sheet is therefore liberated
ree to be ejected from the machine
e frame J next performs its forward
The arm L is preferably made in two
which are connected together by bolts
g through slots l', so that the length
rm can be varied. In this manner I
lily regulate the periods at which the
d sheet is ejected from the machine,
sequently the width of the plain mar-
rtion a^4, Fig. 8, with which the ex-
sheet metal is sometimes provided.
e purpose of firmly holding the metal
hile the knives are acting thereon I
a presser-bar N, Figs. 6 and 7, which
ted at the back of the head F and
guideways formed in the end stand-
of the machine. This presser-bar is
with apertures n' in its lower edge to
of free upward movement of the fin-
when the arms k^3 are raised or shifted,
nbefore stated. The said presser-bar
ormed with vertical slots n^2 at inter-
the reception of lugs or projections
ling out from the back of the head F.
ots and lugs are so situated relatively
other that as the head F ascends and
re completing its upward movement
come against the upper ends of the
d thereby lift the said presser-bar N
ntact with the metal sheet, so as not
e the forward and lateral movements
tter at the required times. When
d F again descends, the presser-bar
to contact with the metal sheet be-
knives E reach it, and therefore the
sser-bar holds it firmly against the
ife D ready to receive the cutting
tching operation. The presser-bar
in this position until again lifted by
n^3 after they reach the upper ends
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mparatively long pause in the move-
the presser-bar thus takes place, so
metal sheet is firmly held during the
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es have ascended beyond the upper
f the metal sheet.
ble the upper knives E to be readily
in the head F and to permit of their
veniently detached therefrom and
by others, I connect them to the head
manner shown at Figs. 9 and 10.
he knives E is bolted to a block E^3
by means of two bolts E^2, and the said blocks E^3 are formed with slots E^4, through which vertical screws E^5 pass for retaining the said blocks to the head F. These slots enable the knives to be shifted in a horizontal direction toward or away from the lower knife D. The under side of the head F has a flange F′, carrying horizontal adjusting-screws E^6, whose inner ends bear upon the aforesaid blocks E^3. By loosening the screws E^5 and turning the screws E^6 the cutting edges of the knives E can be caused to approach nearer to or recede farther from the edge of the stationary knife D. Moreover, the aforesaid knives E can, if desired, be readily detached from the head F and be replaced by others of a different size for producing meshes of larger or smaller dimensions.

One or other of the hereinbefore-mentioned grooves c^3 in the outermost bars c^2 of the table C may be provided with a spring which is adapted to bear with some force against one edge of the metal sheet and hold it tightly in position when the said sheet is inserted into the grooves. By this means I am able to conveniently compensate for sheets of slightly-varying dimensions, whereas without the above compensating device it would be necessary to trim the edges of the sheets or otherwise treat them in order that the sheets should rest properly on the table C; otherwise unsatisfactory results would be obtained when producing expanded metal having small meshes.

The working of the machine is as follows: The metal sheet a is adjusted in the machine by the attendant, who for this purpose stands at the back of the machine and places the end edges of the sheet in the grooves c^3 in the table C. He then pushes forward the sheet as far as it will go, that is to say, until its front edge comes against the fingers k^4, these fingers having assumed their lowered position during the advance of the sheet owing to its front edge coming against and raising the arm L. At this time the head F and its knives E are in their fully-raised position, as also is the presser-bar N, and the frame J is in its forward position. The machine is now set in motion by actuating the treadle i. The head F and presser-bar N then descend together until the said presser-bar, which projects somewhat beyond the knives, bears upon the metal sheet a. The presser-bar now remains stationary while the head F continues to descend, the lugs n^3 and slots n^2 permitting of this movement. As the head F descends its inclines J^3 act upon the rollers J^2 of the frame J, thereby causing the latter to move inwardly, Fig. 7, and the upper end of the apron to be housed in the recesses in the lower knife D. The knives then simultaneously form the series of slits or incisions in the sheet a and stretch the strands of metal a^2, Fig. 1, as already described, the lowest part of the stretched strands now lying in front of the frame J. The head F next com-meshes to rise, and as soon as it ascends high enough to bring its lugs n^2 against the upper ends of the slots n^3 it also lifts the presser-bar N The inclines J^4 are also at this time removed from the rollers J^3, and were it not for the fact that the fingers k^4 are still in front of the metal $a^\times$, Fig. 1, connecting the meshes a' a' to the sheet a, the latter would be fed forward by the outward stroke of the frame J acting under the influence of its springs J^5. It is now, however, that the cam-piece g^3 on the wheel g' arrives in contiguity to the roller c on the table C, and by acting upon the said roller shifts the table laterally for such a distance that the new slits which will be made at the next descent of the knives E will be formed opposite the portions of metal $a^\times$ that were unsevered at the previous operation. The table C in performing its lateral movement and shifting the metal sheet in the above manner removes the portion of metal $a^\times$ connecting the meshes to the sheet, so that the fingers k^4 lie opposite the space in the meshes. These fingers, therefore, now no longer offer any impediment to the feeding forward of the metal sheet, and consequently the frame J rocks forward about its pivots under the action of its springs and feeds the metal sheet forward against the fingers k^4. The extent of this movement is equal to the width of the strand that has been previously cut and stretched. The head F and its knives E, together with the presser-bar N, then again descend and the metal is once more slit and stretched in the manner already described. After this the head F reascends and the table C is shifted laterally in the opposite direction to its former movement by the cam-piece g^4 acting on the opposite side of the roller c. The sheet is then again fed forward by the frame J, as already explained, and is ready for a fresh slitting and stretching operation to be performed. These operations continue until the rear edge of the sheet or blank passes beyond the free end of the arm L. This arm then descends and raises the fingers k^4, as hereinbefore described, so that the complete expanded sheet is delivered from the machine by the increased forward stroke of the frame J as the latter is turned outwardly by its springs. A fresh sheet is then inserted in place on the table C and the machine performs a similar cycle of operations as before.

What I claim is—

1. In a machine for forming expanded sheet metal, the combination with a laterally-shifting support for the sheet, an upper vertically-moving cutter and a lower stationary cutter, said cutters being adapted to slit and simultaneously stretch the metal, of devices for feeding the sheet acting upon the expanded portion thereof, substantially as specified.

2. In a machine for forming expanded sheet metal, the combination with cutters acting to slit and simultaneously stretch the metal as set forth, of devices for feeding the sheet and adapted to act upon the expanded portion thereof, devices for engaging the sheet and serving to regulate the feed, and means for shifting the sheet, substantially as specified.

3. In a machine for producing expanded sheet metal, a feeding device consisting of a hinged or pivoted spring-controlled frame and inclines carried by the reciprocating head of the machine, the said inclines acting upon the hinged or pivoted frame substantially as described and for the purpose specified.

4. In a machine for producing expanded sheet metal, a device for regulating the feed and for enabling any desired width of the expanded metal to be severed from the metal sheet, the said device consisting of arms having fingers at their outer ends and pivotally connected at their inner ends to a shaft which can be rocked in one or other direction and be retained in such position substantially as described.

5. The combination with the herein-described feed-regulating device of means for regulating the position of the fingers, the said means consisting of set-screws k passing through sleeves k^2 carrying the pivoted levers k^3 and acting on opposite sides of the shaft K, feathers k^6 on the said shaft, and segmental slots k^7 into which the said feathers enter, so that by turning the set-screws the sleeves can be shifted angularly in either direction on the shaft substantially as described.

6. In a machine for producing expanded sheet metal means for enabling the expanded sheet to be automatically delivered from the machine, the said means consisting of an arm loosely mounted on the shaft K with its free end normally resting on the sheet of metal passing through the machine, the pivoted arms k^3, and lever mechanism connecting the said arm to the pivoted arms k^3, substantially as described.

7. In a machine for producing expanded sheet metal, the combination with means for cutting and expanding the metal and means for feeding the sheet, of automatic means for determining when the sheet shall be ejected from the machine, substantially as specified.

8. The machine for forming expanded openwork metal sheets, wherein are combined a laterally-shifting support for the sheets adapted to shift between the cutting operations, devices adapted to engage the expanded portion of the sheets and feed them forward, a stationary straight-edged cutter, and a sinuous-edged cutter moving in a fixed vertical plane and coacting with the straight-edged cutter in severing the sheet and acting also to stretch the severed portions in a direction approximately at right angles to the plane of the sheet, substantially as specified.

9. In a machine for producing expanded sheet metal, the combination with means for cutting and expanding the metal and means for feeding the sheet, of an arm L resting at

its free end upon the sheet and serving to determine when the sheet shall be ejected from the machine, substantially as specified.

10. In a machine for producing expanded sheet metal, the combination with means for cutting and expanding the metal and means for feeding the sheet, of an arm L resting at its free end upon the sheet and adjustable as to length and serving to determine when the sheet shall be ejected from the machine, substantially as specified.

11. The combination, in a machine for producing expanded sheet metal, with the cutters, the feed mechanism and the feed-regulating devices, of means for throwing said regulating devices out of action and allowing the sheet to be ejected by the feed mechanism, substantially as specified.

12. The combination, in a machine for producing expanded sheet metal, with the cutters, the feed mechanism and the feed-regulating devices, of adjustable means for throwing said regulating devices out of action and allowing the sheet to be ejected by the feed mechanism, substantially as specified.

JOHN F. GOLDING.

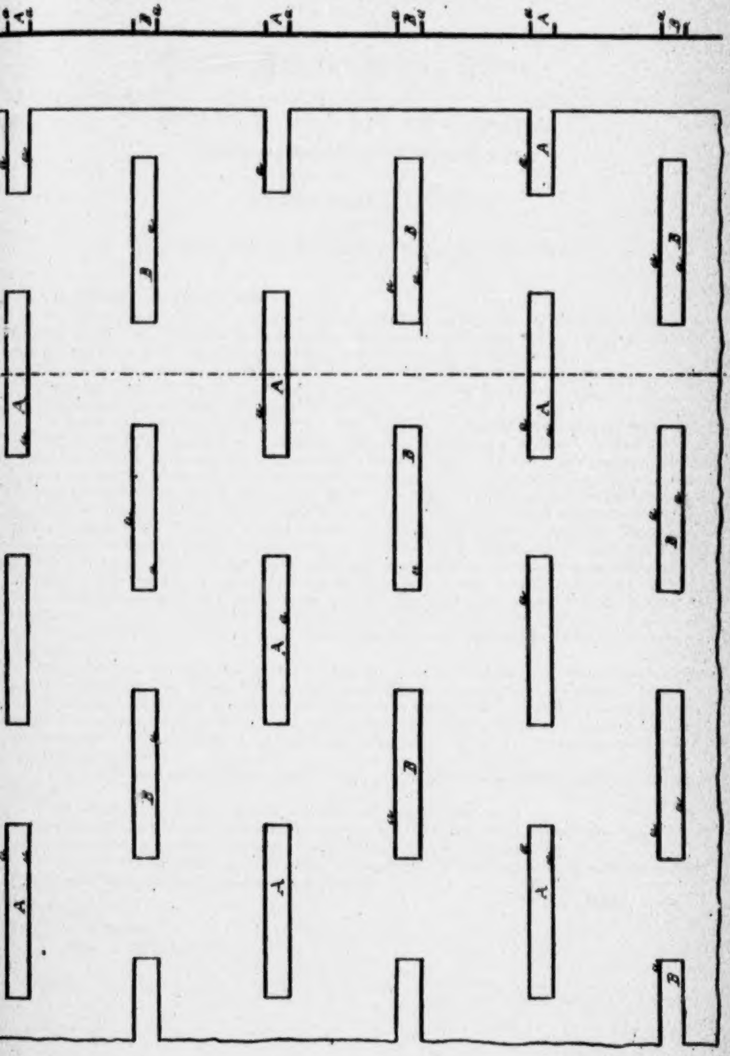
Witnesses:
EDW. S. EVARTS,
H. M. MUNDAY.

Fig 2
Fig. 1

171
260

J. F. Walter, Jr.
Metallic Lathing.

No. 73765 Patented Jan. 28, 1868.



esses:

J. Brown
J. Parker

Inventor:

J F Walter Jr

United States Patent Office.

J. F. WALTER, JR., OF NEW YORK, N. Y.

Letters Patent No. 73,765, *dated January* 28, 1868.

IMPROVED METALLIC LATHING.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, J. F. WALTER, Jr., of the city, county, and State of New York, have invented an Improved Metallic Lathing; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, making part of this specification—

Figure 1 being a side view of a portion of sheet-metal lathing made in my improved manner.

Figure 2, a transverse vertical section thereof, as in a plane indicated by the line *x x*, fig. 1.

Like letters designate corresponding parts in both figures.

I take sheet metal, such as common sheet ir which may be of no great thickness, nor of superior quality, and perforate it lengthwise, (or so as to extend in a horizontal direction when applied,) with oblong slots or apertures, A A and B B, substantially as represented. The metal which comes out of these apertures is divided lengthwise, in the middle thereof, and turned outward at about right angles to the sheet of metal, so as to form lips or burrs, *a a*, at the edges of the apertures, as shown. The apertures may be punched, and the burrs turned out, either by means of cutting and punching-dies, or by passing the sheets between rollers formed for and adapted to the purpose. The means of doing this, however, composes no part of my invention. The apertures are formed in alternate rows, A A and B B, which lap by each other, or "break joints," as represented in fig. 1. This arrangement, with the projecting lips or burrs, gives great firmness and rigidity to the lathing, thereby enabling it to resist warping, springing, or bending out of shape; and it is, therefore, an important feature of the invention, giving it great advantage and superiority over simple perforated plates. It is also cheap of construction, since the burrs *a a* are taken from the apertures, thus requiring no additional surface of metal, and the lathing is cheaply and quickly prepared. The thinness of the sheet sufficient for the purpose enhances the cheapness.

This lathing may be applied to wooden studs, in place of wooden laths, as well as to iron structures, and is about as cheap as wooden lathing, while it makes the building, in a great measure, fire-proof.

The sheets of lathing may be perforated for nails or bolts, when prepared, or nails can be driven through the metal, or into the corners of the apertures. It is preferably put up so as to have the burrs *a a* come inside and receive the plaster, but it might be put up the other side inward. To prevent rusting, the sheet metal may be galvanized or painted.

I do not claim sheet-metal lathing prepared in any manner substantially different from that herein set forth; but

What I claim as my invention, and desire to secure by Letters Patent, is—

Sheet-metal lathing, formed with oblong apertures A A B B, the same being punched in the metal, so as to produce the projecting lips or burrs *a a*, at the edges thereof, substantially as herein specified.

I also claim the overlapping or "break-joint" arrangement of the alternate rows of apertures A A and B B, substantially as and for the purpose herein set forth.

J. F. WALTER, JR.

Witnesses:
J. S. BROWN,
THOS. I. PARKER.

173
264

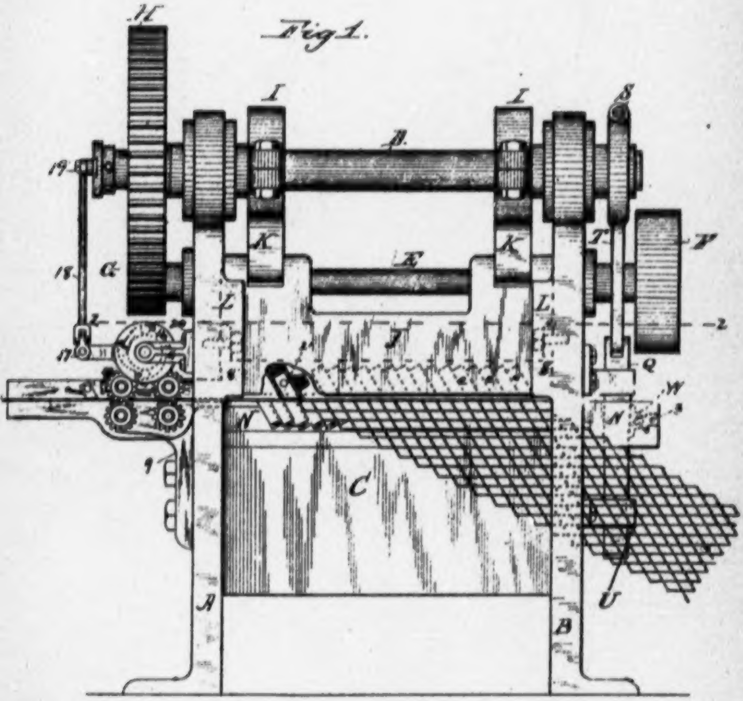
(No Model.) 4 Sheets—Sheet 1.

J. F. GOLDING & G. B. DURKEE.

MACHINE FOR SLASHING AND EXPANDING FLAT SHEET METAL TO FORM MESHES.

No. 381,230. Patented Apr. 17, 1888.

Fig 1.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Witnesses:
Lew. C. Curtis
Taylor E. Brown

Inventors:
John F. Golding.
George B. Durkee.

By Jos. A. Cowles.
their Attorney

174
266

(No Model.)

4 Sheets—Sheet 2.

J. F. GOLDING & G. B. DURKEE.

MACHINE FOR SLASHING AND EXPANDING FLAT SHEET METAL TO FORM MESHES.

No. 381,280

Patented Apr. 17, 1888.

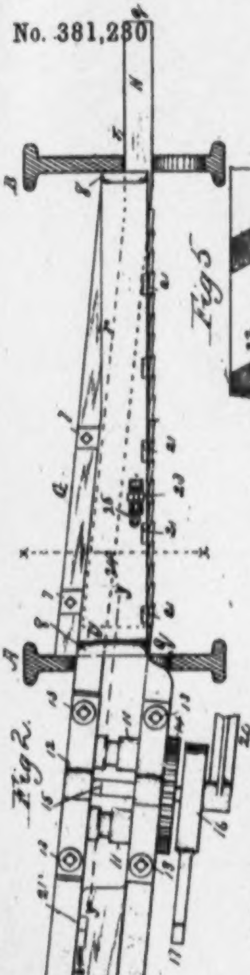

Fig 2.

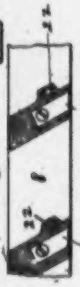
Fig 5.

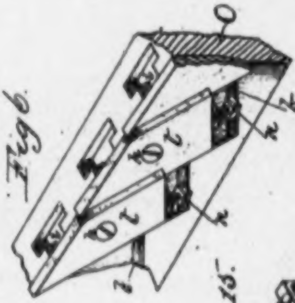

Fig 6.

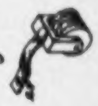
Fig 15.

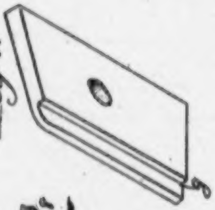
Fig 7.

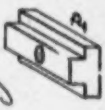
Fig 8.

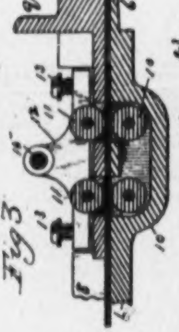

Fig 3.

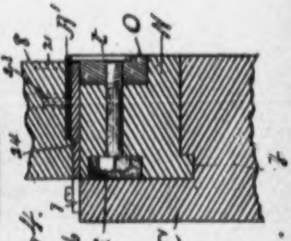

Fig 4.

Witnesses:
Lew. C. Curtis.
Taylor E. Brown

Inventors:
John F. Golding
George B. Durkee

By Jas. A. Cowles
their Attorney.

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(No Model.) 4 Sheets—Sheet 3.

J. F. GOLDING & G. B. DURKEE.

MACHINE FOR SLASHING AND EXPANDING FLAT SHEET METAL TO FORM MESHES.

No. 381,230. Patented Apr. 17, 1888.

Fig. 12.

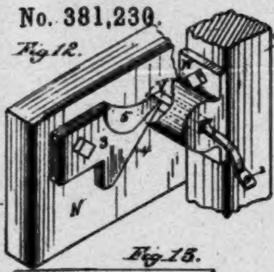


Fig. 9.

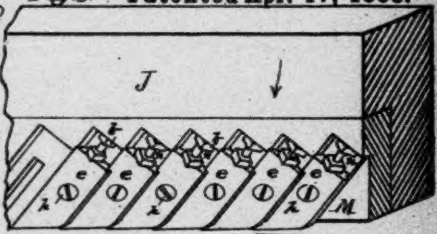
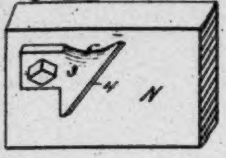


Fig. 13.



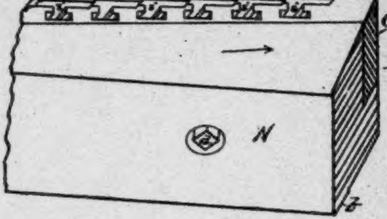
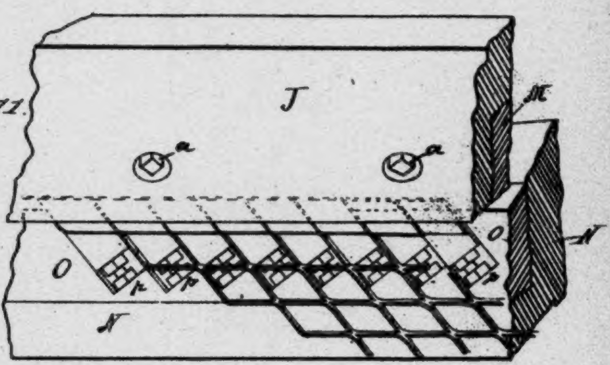


Fig. 10.

Fig. 11.



Witnesses:

Lew. C. Curtis.

Taylor E. Brown

Inventors:

John F. Golding.

George B. Durkee.

By Jas. A. Cowles.

their Attorney.

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odel.)
4 Sheets—Sheet 4.

J. F. GOLDING & G. B. DURKEE.

CHINE FOR SLASHING AND EXPANDING FLAT SHEET METAL TO FORM MESHES.

381,230. Patented Apr. 17, 1888.

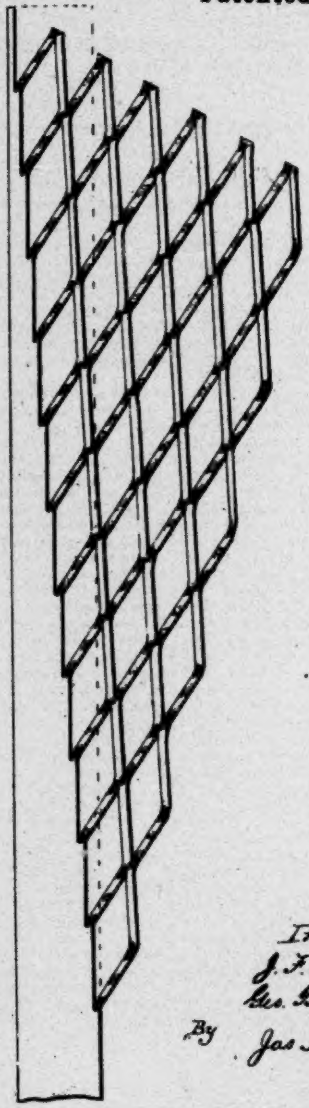


Fig. 14.

tnesses:
Curtis.
r E. Brown

Inventors:
J. F. Golding.
Geo. B. Durkee.
By Jas. A. Cowles.
Their Attorneys.

UNITED STATES PATENT OFFICE.

JOHN FRENCH GOLDING AND GEORGE B. DURKEE, OF CHICAGO, ILLINOIS, ASSIGNORS, BY DIRECT AND MESNE ASSIGNMENTS, TO THE EXPANDED METAL COMPANY, OF MISSOURI.

MACHINE FOR SLASHING AND EXPANDING FLAT SHEET METAL TO FORM MESHES.

SPECIFICATION forming part of Letters Patent No. 381,230, dated April 17, 1888.

Application filed March 31, 1886. Serial No. 196,735. (No model.)

To all whom it may concern:

Be it known that we, JOHN FRENCH GOLDING and GEORGE B. DURKEE, both citizens of the United States, and residents of the city of Chicago, in the State of Illinois, have invented certain new and useful Improvements in Machines for Slashing and Expanding Flat Metal to Form Meshes, of which the following is a specification.

Figure 1 is a front elevation of the machine, also showing the metal formed into meshes issuing from the machine. Fig. 2 is a plan view through line *x x* of Fig. 1. Fig. 3 is a vertical sectional view through line *y y* of Fig. 2. Fig. 4 is a vertical cross-sectional view through line *z z*, Fig. 2. Fig. 5 is a detail front elevation of bar-holding dogs. Fig. 6 is a detail perspective view of lower knife-bar, showing knives in position. Fig. 7 is a perspective of one of the knives. Fig. 8 is a perspective of nut-block. Fig. 9 is a sectional perspective view of upper vertically-traveling beam, showing knives and knife-bar in position. Fig. 10 is a sectional perspective of lower longitudinally-traveling bar, showing knife-bar and upper ends of knives attached thereto. Fig. 11 is a reverse view of Figs. 9 and 10, showing strands of expanded metal in connection therewith. Fig. 12 is a detail perspective of device for actuating lower longitudinally-traveling bar. Fig. 13 is a detail perspective of cam shown in Fig. 12. Fig. 14 shows a piece of flat metal partially cut and partially uncut and expanded in the form of meshes. Fig. 15 shows roller with threaded surface and spring to force it down.

The nature and object of this invention are to provide a machine for cutting and expanding flat metal into the form of meshes.

Similar letters and figures of reference refer to similar parts in the different figures.

A and B are the end frames of the machine, connected together by a bed-piece, C.

D is the main shaft, working in the frames A and B, provided with suitable bearings.

E is the driving-shaft, secured to frames A and B by suitable boxing, having at one end the pulley F and at the other end the spur gear-wheel G, the latter not shown in the drawings, but being located at the rear of main gear-wheel H and gearing therewith.

I I are eccentrics located on shaft D between the frames A and B.

J is the vertically-traveling cross-head, connected to eccentrics I I by links K K and traveling in guides L L on frame A B.

M is the knife-bar attached to the vertically-traveling cross-head J, and secured thereto by suitable bolts, *a a*, Fig. 11.

N is the longitudinally-traveling bar, located on bed-plate C, as shown in Figs. 4 and 10, provided with guide *b*, working in a slot in the bed-plate C.

O is the knife-bar attached to the longitudinally-traveling bar N, and fastened thereto by bolt *d*.

e e e are knives attached to the upper knife-bar, M, placed at an angle thereon, as shown in Fig. 9 and in dotted lines on beam J, Fig. 11. The said knives are fastened to the knife-bars M and O, Figs. 9, 10, and 6 by countersunk bolts *h*, which pass through the knife and into the nut-block P. This nut-block is in T form and fits in corresponding recesses, *i i*, in bars M and O, Figs. 6 and 10. These knives are made adjustable upward and downward by bolts and jam-nuts *n n*, located at one end, Figs. 6 and 9, and working against shoulders *b*.

The knives in both upper and lower bars are secured in the same manner by the use of nut-blocks P, which are similarly located in both bars, and also are adjustable by the bolts and jam-nuts *n n*, similarly located in the respective bars. The knives *t*, Fig. 6, on lower bar, O, also are placed at an angle with the bar to which they are attached. The knives on the upper bar are set facing the knives in the lower bar, as shown in Figs. 9, 10, and 11. In the simultaneous respective movements of the upper and lower bars the inclined surfaces of the upper knives move along parallel with the inclined surfaces of the lower knives, the faces of the knives fitting closely together. The lower longitudinally-traveling bar, N, is of a wedge form, as shown in Figs. 10 and 2. In Fig. 2 it is more clearly shown extending from g to g, the dotted line r showing the rear beveled edge, the knives covering the front line of the bar. On the end of shaft D, Fig. 1, opposite gear-wheel H, is the eccentric S, from which extends pitman T, which actuates plunger Q, and the latter, working in box U, Fig. 1, actuates pawl V, which is located in box W and held in position by the spring 2. (See Fig. 12.)

3 is a cam located on longitudinally-traveling bar N, Figs. 1, 12, and 13, having under edge, 4, cut beveled, Figs. 12 and 13. On the upper surface of the lower longitudinally-traveling bar, N, is a stationary plate, 6, firmly fastened to lower bed-plate by projections 7 7, Figs. 2 and 4, extending through frame A and supported by brackets 9, Fig. 1.

8, Figs. 3 and 4, is a pressure-bar, located above plate 6, extending between and secured to frame A B, as is also shown by dotted lines in Fig. 1. This pressure-bar 8 extends through frame A to the front of the feeding device over plate 6. In Fig. 3 are shown the plates 6 and 8 and the feeding device attached thereto.

10 10, Fig. 3, are lower feed-rolls in cut-away part of plate 6. 11 11 are upper feed-rolls in plate 8. The surfaces of these feed-rolls are corrugated. The feed-rolls 11 11 are held in place by cap 12 and tension-springs and bolts 13 13. (Shown in Figs. 2 and 3.)

In Fig. 3 the upper rollers, 11 11, are shown annularly grooved to allow plate 8 to remain in a continuous strip, the lower rolls being similarly grooved for a like purpose. These feed-rolls are actuated by gears at one end of each, which are driven by a larger wheel, Fig. 2, on shaft 15. On this shaft is a clutch-wheel, 16, with arm 17, Figs. 1 and 2, joined to the lower end of connecting-rod 18, which is connected to crank-pin 19 on main shaft D. This crank-pin is adjustable by means of a slot and a set-screw. The end of shaft 15 works in caps 12, Figs. 2 and 3, and its projecting end is supported by bracket 20, attached to frame A.

In pressure-bar 8, Figs. 1, 2, 4, and 5, are shown dogs 21, loosely attached to said bar at their upper ends by a bolt and dropping obliquely therefrom, and on their upper sides are set springs 22, their lower beveled ends being serrated and located close to the upper knives.

23, Figs. 2 and 4, is a roller having screw-like projections, forming corresponding annular grooves on its surface, set in bar 8, and set at an angle with the rear face of the lower bar, N, and is pressed downward by spring 25, Fig. 15.

The under surface of the pressure-bar 8, Fig. 4, is partially cut away, leaving flange 24, which fits into a correspondingly cut-away part in plate 6, for the purpose of forming a guide.

The operation of our machine is as follows: Motion is communicated to the main driving-wheel by pulley F and through intermediate connections to eccentrics, which in turn raise and lower the cross-beam J, to which are secured the upper knives. As the upper knives descend, their inclined edges engage with the inclined edges of the lower knives, causing the lower bar, N, and its knives to travel in a longitudinal direction, as indicated by the arrows in Figs. 9 and 10. As the upper beam, J, descends in direction indicated by the arrow, the plunger Q also descends, being actuated by eccentric S. In this act of descending the pawl V passes over the sloping surface 5 of cam 3, Fig. 12, when it is returned beneath the beveled edge 4 of said cam by spring 2. In the upward movement of the plunger the pawl V moves upward in a vertical line, and by this act forces a return of bar N to its original position.

It will be observed that in its longitudinal movement the lower bar, N, moves in a direction oblique to the face to which the knives are secured, the knives in both upper and lower bars being set at an angle with the plane of these bars, and as the upper knives, having beveled or inclined edges, have to pass downward along the beveled or inclined edges of the lower knives, causing a downward shear cut, the rear plane of the lower bar is correspondingly beveled to allow the knives to travel in their individual planes.

A', Fig. 3, is a piece of flat metal fed between the bars 6 and 8, and by means of the feed-rolls is carried over the knives of the lower bar intermittingly along the line of the guide 24, Figs. 4 and 3. Consequently it is first brought in contact with the knives at one of its corners, and that part between the knives is simultaneously cut and pressed downward by the downward movement of the upper knives, the receding action of the lower knives allowing the cut strands to be expanded downward and to contract endwise. At the next feed it is evident that the metal will encounter additional knives, and so on until it has passed to the knife farthest from the feed-rolls, when at each downward stroke the upper knives of the machine are cutting to their full capacity.

In Fig. 11 is shown the position of the strands being cut and bent downward from the plane of the metal, the length of the uncut spaces depending upon the length of the feed. The feed-rollers are actuated from a crank-pin on the main shaft D. In Fig. 1 is shown the material cut and expanded, with an uncut portion in the act of being fed into the machine. The metal passes under dogs 21 freely, and is clutched by the dogs through the action of springs 22, and is firmly held between the dogs and plate 6, allowing the longitudinally-traveling bar N to be freely moved by the cutting action of upper knives, the dogs preventing the retreat of the metal while it is being cut, which otherwise would be forced backward by the shearing cut of the upper knives. As the metal is fed into the machine, it passes under guide-wheel 23, which revolves at an angle with the direction of the travel of the metal.

The clutch which actuates the feed-rolls can be any kind that will grasp the shaft and turn it in one direction and slip by the shaft in the other direction.

We claim—

1. In a machine for cutting and expanding flat metal into meshes, the combination of two sliding cutter-heads each provided with cutters and each set of cutters arranged in step form on its respective head, the movement of one cutter-head being longitudinal and the movement of the other being at or near a right angle thereto, the cutters of each set adapted to fit into and pass over the faces of the other set, and a suitable intermittent feeding device arranged and adapted by means of mechanism to feed metal between said cutters in line with and in the direction of the forward travel of said longitudinally-traveling head.

2. In a machine for cutting and expanding flat metal into meshes, the combination of two sliding cutter-heads each provided with cutters and each set of cutters arranged in step form on its respective head, the movement of one cutter-head being longitudinal and the movement of the other being at or near a right angle thereto, the cutters of each set adapted to fit into and pass over the faces of the other set, and a suitable fixed guide located at the rear of and parallel with the travel of said longitudinally-sliding head.

3. In a machine for cutting and expanding flat metal into meshes, the combination of two sliding cutter-heads each provided with cutters and each set of cutters arranged in step form on its respective head, the movement of one cutter-head being longitudinal and the movement of the other being at or near a right angle thereto, the cutters of each set adapted to fit into and pass over the faces of the other set, and a suitable clamping device constructed substantially as described and adapted for holding the metal and preventing its retreat while it is being cut and expanded.

JOHN FRENCH GOLDING.
GEORGE B. DURKEE.

Witnesses:
JAS. A. COWLES,
FELIX J. GRIFFEN.

(No Model.)

179
276

I. S. ELKINS.

METAL LATHING.

No. 408,599. Patented Aug. 6, 1889.

Fig. 1.

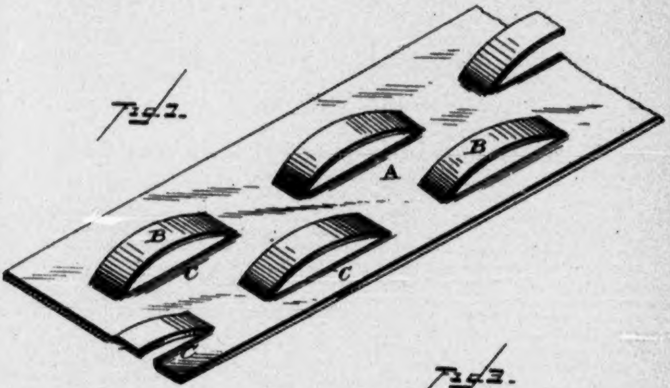


Fig. 2.

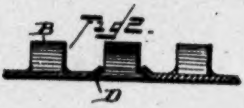


Fig. 3.

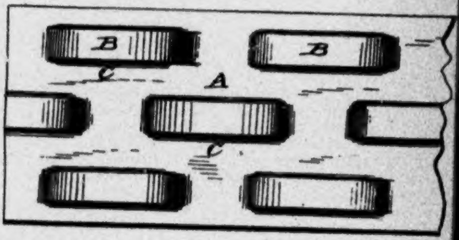


Fig. 4.

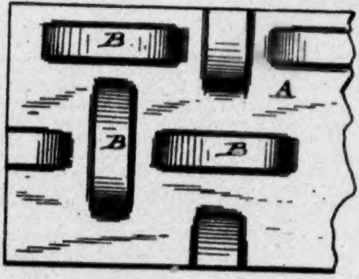
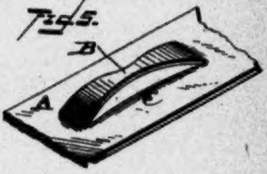


Fig. 5.



WITNESSES:
F. L. Ourand
L. Deane

INVENTOR:
Ira S. Elkins

By J. S. Zerk
Attorney.

180

277

UNITED STATES PATENT OFFICE.

IRA S. ELKINS, OF NEW YORK, N. Y.

METAL LATHING.

SPECIFICATION forming part of Letters Patent No. 408,599, dated August 6, 1889.

Application filed April 22, 1889. Serial No. 308,193. (No model.)

To all whom it may concern:

Be it known that I, IRA S. ELKINS, of New York, in the county of New York and State of New York, have invented a new and useful Improvement in Metal Lathing, which improvement is fully set forth in the following specification and accompanying drawings, in which—

Figure 1 is a perspective view of my improved metal lathing. Fig. 2 is a cross-section showing one of the loops; Fig. 3, a top view showing the disposition of the loops over the surface of the metal; Fig. 4, a top view showing a modified form of placing the loops; and Fig. 5, a view showing a modified construction of the loop.

The object of this invention is to provide a simple, easily-manufactured metal lathing, so constructed that it will require the smallest possible amount of mortar, and which will form a strong durable wall when in position, and is so made that it can be readily utilized for brackets, cornices, or other purposes, as well as for plain plastering purposes.

It consists in having the lath made of sheet metal with loops drawn up at regular intervals over its face, and in further providing the edges of the slots, from which the loops are drawn, with upwardly-turned flanges, whereby the mortar is provided with rounded faces on the back side of the sheet, so as to prevent cutting of the back clinch, all of which will now be set forth in detail.

In the accompanying drawings, A represents the sheet of metal, of any suitable gage and size. In this sheet I cut parallel slits in pairs, at regular intervals, so that the rows alternate, as shown in Fig. 3. The body of the metal between the slits is then drawn forward or upward by suitable dies, so as to form loops B. The outer surfaces of these loops are slightly rounded, as shown. All the loops are on the face side of the plate, or on the side to which the mortar is applied, thereby furnishing a plain smooth back face to the plate, enabling it to be snugly fitted to the joist or studding.

Each of the slitted edges of the body of the plate is flanged, as shown at C—that is, the edge adjacent the slit is turned outwardly or forwardly, so as to form a rounded edge on the rear side, as shown at D, Fig. 2. The flanging of these edges serves a double purpose, first, to prevent too great a waste of mortar through the openings between the loop and slitted edge of the metal, and, second, to form a rounded edge, against which the clinching-tongue of the mortar can rest without being cut off, as would otherwise be the case, by its own weight. The loops thus constructed form arches over the entire surface of the plate, making it very rigid, and greatly adding to the strength of the plate. As the loops are directly over the openings from which they are drawn, only a comparatively small amount of mortar will pass through the openings, thus effecting a great saving in the amount of mortar used, as compared with wood or wire lathing, and requiring much less mortar than is used on any other form of metal lathing which depends on open work to secure the clinch.

While I prefer the disposition of the loops as shown in Fig. 3, it is obvious that the loops may be placed at right angles to each other, as shown in Fig. 4. It is obvious that by placing the loop in this way the plate becomes trussed in both directions, an advantage not obtainable where the loops are in rows, as shown in Fig. 3. For certain purposes, and especially where no bending of the plate is required, the right-angled disposition of the loops is preferable.

I prefer having the loops of equal width throughout, as shown in Figs. 1 and 3; but instead of having them thus made the loops may be narrowed in the middle, as shown in Fig. 5. This provides wider upturned flanges at the sides of the loop, which may be an advantage for certain kinds of work, especially where a heavy coating of mortar is desired on the walls.

What I claim as new is—

1. A metal lath consisting of a piece of metal formed with a series of pairs of parallel slits arranged at suitable intervals, and having the body of the metal between the slits of each pair drawn forward or upward to form loops, all upon the same side of the sheet, and the edges of the slits adjacent to the loops being provided with forwardly or upwardly-turned flanges.

2. A sheet-metal lath having loops made

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in its face, arching over the openings thus formed, the edges of the openings having upward flanges, substantially as specified.

3. As a new article of manufacture, a sheet-metal lath having loops made at regular intervals over its entire surface on one side only, and upwardly or forwardly turned flanges along the edges of the said openings, substantially as described.

4. A metal lath having expanded loops on one side only, the said loops covering or arching over the openings from which the loops are formed, substantially as described.

In testimony that I claim the foregoing I have hereunto set my hand this 1st day of January, 1889, in the presence of witnesses.

IRA S. ELKINS.

Witnesses:

J. S. ZERBE,

LOUIS ITSCHNER.

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(No Model.) 3 Sheets—Sheet 1.

G. A. OHL.

MACHINE FOR MAKING METAL LATHING.

No. 475,700. Patented May 24, 1892.

Fig. 2.

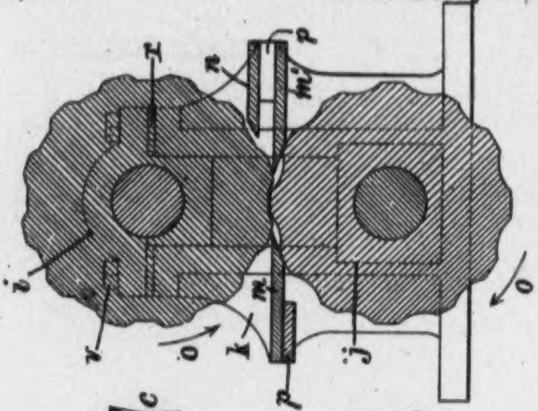
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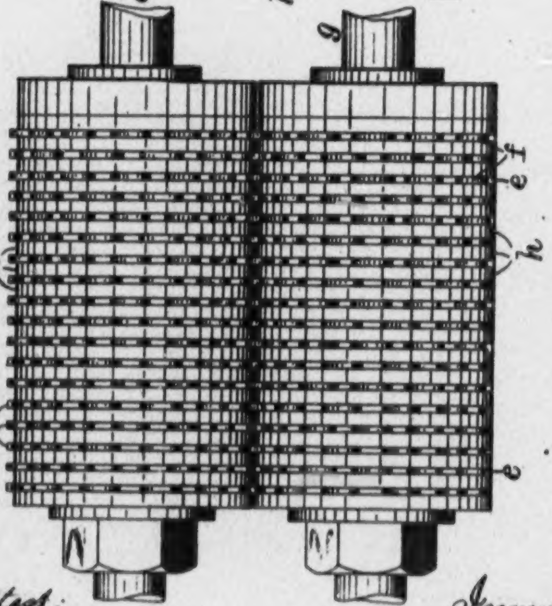
Fig. 1.



Attest:
Chas. R. Rhodes.
H. M. Latham.

Inventor
George A. Ohl per
Crane & Miller, Attys.

(No Model.)

3 Sheets—Sheet 2.

G. A. OHL.

MACHINE FOR MAKING METAL LATHING.

No. 475,700.

Patented May 24, 1892.

Fig. 9.

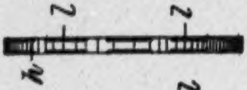


Fig. 8.

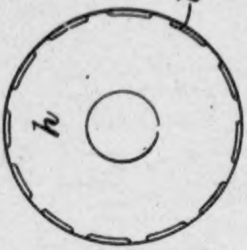


Fig. 7.

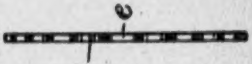


Fig. 6.

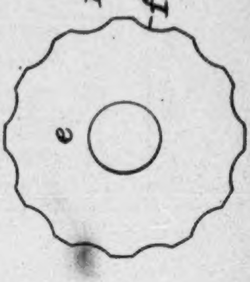


Fig. 3.

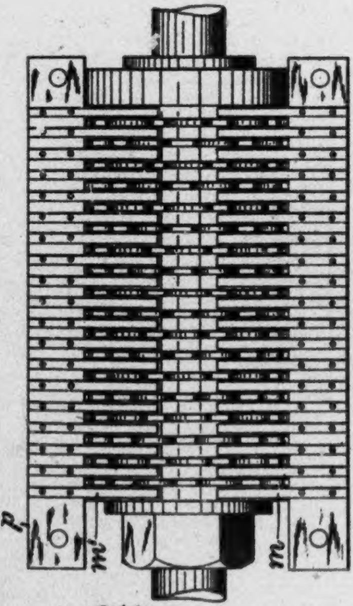
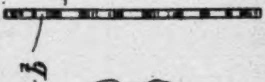


Fig. 5.



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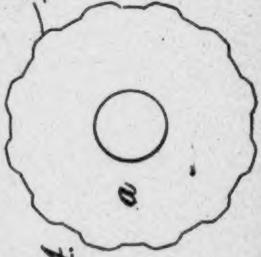

Attest:
F. C. Fischer.
J. Van Nest Jr

Inventor
George A. Ohl, per
Clarence Miller, att'y

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No. 47

Fig

Fig

184

284

3 Sheets—Sheet 3.

G. A. OHL.

MACHINE FOR MAKING METAL LATHING.

,700 Patented May 24, 1892.

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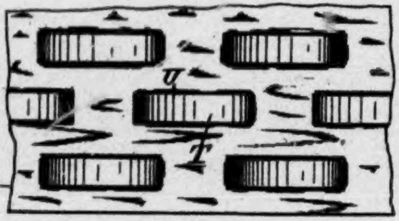

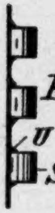

Fig. 12.

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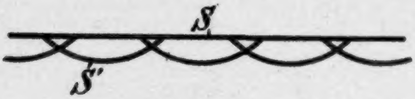
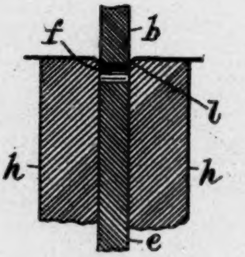


Fig. 13.



Attest:
F. C. Fischer.
Alan Nest Jr.

Inventor
George A. Ohl per
Cramer Miller, attys

UNITED STATES PATENT OFFICE.

GEORGE A. OHL, OF NEWARK, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE BOSTWICK METAL LATH COMPANY, OF NEW YORK.

MACHINE FOR MAKING METAL LATHING.

SPECIFICATION forming part of Letters Patent No. 475,700, dated May 24, 1892.

Application filed April 9, 1890. Serial No. 347,281. (No model.)

To all whom it may concern:

Be it known that I, GEORGE A. OHL, a citizen of the United States, residing at Newark, Essex county, New Jersey, have invented certain new and useful Improvements in Lath-Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The apparatus herein described is adapted to form slots in a sheet of thin metal, with strips attached at both ends to the sheet behind the slot to form a metallic lath to retain plaster upon walls; and the improvement consists in the particular construction of the rolls and strippers hereinafter described.

In the annexed drawings, Figure 1 is a diagram representing the two rolls with portions of their journals. Fig. 2 is a transverse section of such rolls and their strippers, with an elevation of the journal-bearings. Fig. 3 is a plan of the bottom roll with the strippers and stripper-plates. Fig. 4 is a side view, and Fig. 5 an edge view, of one of the punching-disks. Fig. 6 is a side view, and Fig. 7 an edge view, of one of the recessed disks; and Fig. 8 is a side view, and Fig. 9 an edge view, of one of the shearing-disks. Fig. 10 is a plan, and Fig. 11 an edge view of a portion of the sheet-metal lath perforated at two points; and Fig. 12 is an end view of the piece shown in Fig. 10. Fig. 13 is a section of a portion of the disks shown in Figs. 5, 7, and 9, with the piece of sheet metal bent prior to the shearing operation of the punching-disk.

In Fig. 10, S is a portion of the metallic lath, and S′ the strips attached to the sheet at the opposite ends of the apertures T. These strips are formed by sustaining the sheet over suitable recesses and shearing the edges of the strip from the sheet, at the same time stretching the strip longitudinally and bending it into a curve below the aperture, as shown in Fig. 11. The plaster when applied to the flat side of the metallic lath is thus enabled to penetrate through the apertures T and to exude laterally between the strip and the metallic sheet to lock upon the rear side thereof. To hold the plaster more securely in the apertures T, the longitudinal edges U of the aperture through which the strip is sheared require to be bent inward, as shown in Figs 10 and 12.

My apparatus consists in a series of punching-disks secured together with intermediate collars to form a punching-roll and recessed disks secured together with intermediate shearing-disks to form a die-roll. The punching-disks *a*, as shown in Figs. 4 and 5, each consist of a plate of steel having the same thickness as the width of the apertures T and provided upon its periphery with a series of teeth *b*, adapted each to form one of the apertures. These disks are secured together upon a spindle *c*, Fig. 1, to form a punching-roll, with a series of intermediate collars *d*, above which the teeth *b* project.

The die-roll consists of a series of disks *e* of the same thickness as the disks *a* and notched each upon its periphery with a series of recesses *f*, corresponding with the teeth *b*. These disks are secured together to form a die-roll upon a spindle *g*, with a series of intermediate collars *h* of the same diameter as the recessed disks.

The rolls thus composed are mounted in bearings *i* and *j* in a suitable frame *k* and rotated to force the teeth *b* into the recesses *f*, as shown in Figs. 1 and 2. The teeth *b* operate against the collars *h* to shear the edges of the strips S′ from the sheet and to force the strip downward into the recess, stretching it longitudinally and shaping it, as desired.

The collars *h* are shown formed with a bevel *l* upon their edges adjacent to the disks *e* to bend the edges U at the sides of the apertures T inward toward the strip. Such bevel is preferably formed at intervals corresponding with the recesses *f*, but may be extended all the way around the collars; but it would then have no effect, except where the teeth *b* press the sheet metal into contact therewith. Such bending is effected by the pressure of the teeth *b* before the latter come into shearing contact with the collars *h*, as is clearly shown in Fig. 13, where the tooth *b* is shown pressed upon the sheet metal sufficiently to bend it inward against the bevel *l*. The continued movement of the punch into the recess *f* would obviously shear the lateral edges of the strip and force it into the recess, as desired.

As shown in Figs. 1 and 3, the disks *a* and *e* are arranged with the teeth and recesses alternated, so as to form the apertures T in the sheet S in diagonal lines; but the section in Fig. 2 shows only one pair of the opposed disks, with the sections *h* in the lower roll, and does not show the alternate arrangement of the teeth and recesses, as it would greatly confuse the drawing.

To prevent the sheet from clinging to the teeth *b* or to the recesses in the die-roll, a series of narrow strippers are fitted to the collars between the disks *a* or *e*. Two series of strippers *m m'* are provided upon the lower side of the sheet at both sides of the die-roll, and strippers *n* are provided upon the clearance side of the punching-roll, the rolls rotating in the direction indicated by the arrows *o* in Fig. 2. The sheet, which clings strongly to the recesses or to the teeth *b*, is thus prevented from wrapping around either of the rolls.

To facilitate the removal of either series of the strippers, each series is secured upon a bar *p*, which is attached to a lug *q* upon the frame *k*.

I have found that a slight variation in the thickness of the sheet metal required a separate and rigid adjustment of the punching-roll toward the die-roll, and I therefore sustain the bearings *i* of the spindle *c* upon the frame *k* with intermediate packing-plates *r*. The bearing *i* is attached to the frame by bolts *v*, which clamp the same firmly to the frame upon the packing-plates, and thus hold the punching-roll very rigidly when in operation.

It is obvious that the punching-disks *a* are of uniform character and may therefore be made all at once by suitable milling or cutting tools, as well as the recessed disks *e*.

The punching-disks and the collars *h*, against the edges of which the teeth *b* operate to shear the sheet metal, may be separately hardened, and when clamped upon their respective spindles form a roll adapted to rotate truly, which would not be the case if the roll were made of a solid cylinder of steel.

By forming rolls in disk-like sections any of the parts which may be injured can be readily renewed with trifling expense.

The collars *d* intermediate to the toothed disks *a* are used, chiefly, to hold the punching-disks at a suitable distance apart; but they are preferably made of suitable diameter to press the sheet metal between the apertures T against the collars *h*, so as to flatten and smooth the same during the cutting operation.

Having thus set forth the nature of my invention, what I claim herein is—

1. In a lath-machine for punching sheet metal, the combination, with a punching-roll having a series of toothed disks, of a die-roll comprising a series of recessed disks and intermediate shearing-collars, substantially as herein set forth.

2. In a lath-machine for punching sheet metal, the combination, with a punching-roll having a series of toothed disks, of a die-roll comprising a series of recessed disks and intermediate shearing-collars beveled at their edges adjacent to the recesses, as and for the purpose set forth.

3. In a lath-machine for punching sheet metal, the combination, with a die-roll consisting in a series of beveled collars *h* and an intermediate series of recessed sections *e* of the same diameter, of a punching-roll consisting in a series of toothed disks *a*, with intermediate collars *d*, adapted to press the sheet metal upon the collars *h*, as and for the purpose set forth.

4. In a lath-machine for punching sheet metal, the combination, with a punching-roll having a series of toothed disks with intermediate collars and a die-roll having a series of recessed disks with intermediate collars, of a series of strippers applied to the die-roll and a series of strippers applied to the punching-roll, the whole arranged and operated substantially as herein set forth.

5. A lath-machine for punching sheet metal, comprising a punching-roll having a series of toothed disks with intermediate collars, a die-roll having a series of recessed disks with intermediate collars, strippers applied to the die-roll and punching-roll, a suitable frame with bearings for one of the rolls, and bearings for the other roll attached to the frame by bolts, with intermediate packing-plates *r*, the whole arranged and operated substantially as herein set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

GEORGE A. OHL.

Witnesses:

CHARLES W. TEN EYCK,
HENRY J. MILLER.

187
287 19

Expanded M. co /

[Second Edition.]

he Expanded Metal Co. et al
vs.
ugene S. Bradford. et al } No. 14.
April Sessions 1
Defendants Exhibit British
Patent to Long No. 2 25.

John A. [illegible]
Examin

A.D. 1862, 26th July. N° 2125.

Manufacture of Open Metal Work.

(*This Invention received Provisional Protection only.*)

PROVISIONAL SPECIFICATION left by Thomas Long at the Office of the Commissioners of Patents, with his Petition, on the 26th July, 1862.

I, Thomas Long, of 2, Clarendon Place, Notting Hill, in the County of Middlesex, House Decorator, do hereby declare the nature of the said Invention for "IMPROVEMENTS IN THE MANUFACTURE OF OPEN METAL WORK APPLICABLE TO VARIOUS USEFUL PURPOSES," to be as follows, that is to say:—

This Invention relates to an improved manufacture of open metal work, or metal trellis or lattice work intended to be used as an economical substitute for ordinary wire netting or perforated metal, and applicable also to the manufacture of bird cages, basket stands, and supports for flowers, fire-guards, and other purposes where wire work has hitherto been employed.

According to this Invention, it is proposed to make open metal work, or trellis or latticework by making a number of slits in a flat sheet of metal, such slits being made in straight or curved lines or row, the slits in each line or row being made to break joint with the adjoining lines or rows, a small portion of the metal being left intact or uncut between the ends of the several slits. The sheet having been thus slit, is now stretched out so as to open the slits, whereupon a perfectly-formed trellis having hexagonal openings will be produced. In order to form a finish to, and strengthen the edges of this open metal work, it is proposed to turn up the edges of the plate before it is

[*Price 3d.*]

Long's Improvements in the Manufacture of Open Metal Work.

stretched, and to insert therein a length of wire, which, when the metal is stretched, will remain threaded through each of the end tongues of the metal work. The slitting of the metal sheets may be effected either by suitable slitting rolls, stamping apparatus, or by hand cutters or tools, as preferred.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.
[G. 7838—25—3/1904.]

189

291 203

A.D. 1885. Sept. 23. Nº 11,332.
JOHNSON'S Complete Specification.

(1 SHEET)

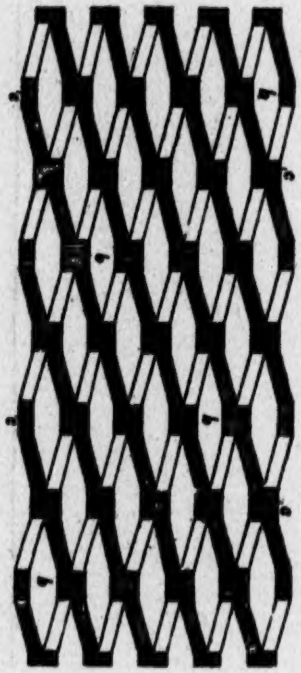


FIG.2.

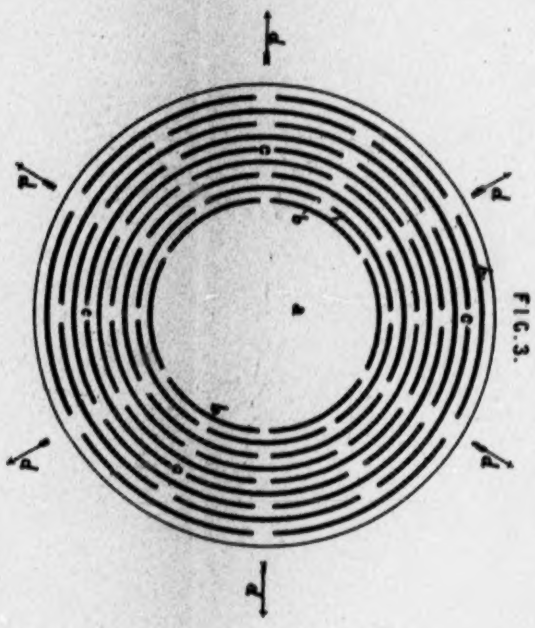

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FIG.3.

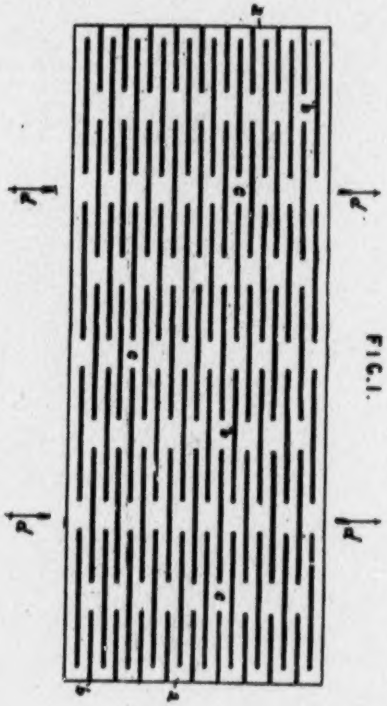
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FIG.1.

London. Printed by Eyre and Spottiswoode,
Printers to the Queen's most Excellent Majesty. 1885.

Malby & Sons, Photo-Litho.

The Expanded Metal Co. et al } No. 17. 19
vs.
Eugene S. Bradford, et al } April Sessions,
Defendants Exhibit, British
Patent to Johnson, No 11,332.

Examiner.

A.D. 1885, 23rd SEPTEMBER. Nº 11,332.

PROVISIONAL SPECIFICATION.

[*Communicated from abroad by Florian Tentschert, of Mödling, Vienna, in the Empire of Austria, Engineer.*]

Improvements in the Manufacture of Open Metal Work for Use as Lattice Work, Trellis-work, Sieving, or the like.

I JAMES YATE JOHNSON of 47 Lincoln's Inn Fields in the County of Middlesex Gentleman do hereby declare the nature of this Invention which has been communicated to me from abroad by Florian Tentschert of Mödling Vienna in the Kingdom of Austria Engineer to be as follows:—

This Invention has for its object to manufacture simply expeditiously and cheaply metal sheets into lattice work, trellis-work sieving or equivalent open metal work—According to this Invention a metal sheet is taken and at intervals rows or circles of slits or slots are formed the slits or slots of each row "breaking bond" with those of the adjacent row or rows—The plate is then pulled in a direction or directions transversely to the length of the slits or slots and over a suitable former or mould if desired and there is thus produced an open metal work suited to the purposes to which ordinary lattice work or woven or interlaced metal strips or wires are usually applied.

Dated this 23rd day of September 1885.

J. HENRY JOHNSON,
47, Lincoln's Inn Fields, London, W.C.

the lattice or trellis work produced will be increased over that of the unstretched sheet or plate.

In the modification illustrated by Figure 3 the circular metal sheet a is provided with concentric rows of slits and is intended for use in making baskets or other articles of a cylindrical circular or conical form.

This may be effected in any convenient manner such as by stretching the sheet out on or over a form or model of the required shape by means of suitably arranged stretching mechanism as hereinbefore mentioned.

The length or size of the slits or slots and their distance from each other as well as the kind of metal and thickness of sheet employed may be varied according to the quality and purpose for which the article to be produced is to be used. Metal lattices or trellis work constructed as hereinbefore described may be advantageously employed in place of that hitherto made by netting or twisting metallic wires or by rivetting strips or bands of metal together by means of costly and complicated machinery.

Having now particularly described and ascertained the nature of this Invention and in what manner the same is to be performed I declare that what I claim is

1st The manufacture of open metal work for use as trellis-work lattice-work sieving or other purpose by slitting or slotting a plate or sheet of metal and afterwards pulling stretching or opening out the slitted or slotted sheet or plate substantially as hereinbefore described.

2nd Articles for use as trellis work, lattice work sieving or other purpose for which interlaced or interwoven strips are employed the said articles being made from slitted or slotted and stretched or opened out metal sheets or plates substantially as hereinbefore described.

3rd Articles of open metal work produced by slitting or slotting a metal plate or sheet and stretching and forming it over a shape or mould substantially as hereinbefore described.

Dated this 16th day of October 1885.

J. HENRY JOHNSON,
47, Lincoln's Inn Fields, London, W.C.

LONDON: Printed by Eyre and Spottiswoode,
Printers to the Queen's most Excellent Majesty.
For Her Majesty's Stationery Office.
1885.

5

COMPLETE SPECIFICATION.

Improvements in the Manufacture of Open Metal Work for Use as Lattice Work, Trellis Work, Sieving, or the like.

I, JAMES YATE JOHNSON of 47 Lincoln's Inn Fields in the County of Middlesex Gentleman do hereby declare the nature of this Invention which has been communicated to me from abroad by Florian Tentschert of Mödling Vienna in the Kingdom of Austria Engineer and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This Invention has for its object to manufacture simply expeditiously and cheaply metal sheets into lattice-work trellis-work sieving or equivalent open metal work—According to this Invention a metal sheet is taken and at intervals rows or circles of slits or slots are formed, the slits or slots of each row "breaking bond" with those of the adjacent row or rows—The plate is then pulled in a direction or directions transversely to the length of the slits or slots and over a suitable former or mould if desired and there is thus produced an open metal work suited to the purposes to which ordinary lattice work or woven or interlaced metal strips or wires are usually applied.

And in order that this Invention may be fully understood I shall now proceed to describe more particularly with reference to the accompanying drawing the manner in which the same may be performed.

Figure 1 represents a metal sheet having longitudinal parallel slits formed therein ready to be stretched or pulled and opened out, and Figure 2 represents the same sheet after it has been stretched or pulled and opened out.

Figure 3 shows a circular sheet of metal provided with concentric slits ready to be pulled or stretched and opened out.

A sheet *a* of any suitable metal or alloy capable of being rolled, such for example as iron steel brass or the like and of the required thickness is taken and placed in a suitable machine or operated upon by a cutting or stamping instrument to produce therein parallel rows of slits or slots as shew at *b* in Figure 1 in such a manner that the full parts *c* of one row or range of slits are opposite to the slitted parts *b* of the adjacent row or rows as shewn in Figure 1—A slotting machine of any well known or suitable construction may be employed for making the slits in the plate *a*, care being taken that the slits of the several rows are arranged in the particular manner before described and shewn so that when the sheet is pulled stretched or opened out openings will be formed as shewn.

The sheet *a* thus slitted or slotted is then pulled or stretched in the direction of the arrows *d. d* that is to say transversely to the direction of the slits—The sheet *a* may be pulled or stretched either when cold or it may be heated before being stretched.

This pulling or stretching or opening out of the slits or slots may be effected by means of any suitable stretching apparatus such for example as a combination of pairs of blocks between which the opposite sides of plate are held the blocks being forced apart by screw or other power.

By stretching out the sheet a lattice work having hexagonal openings or meshes is formed as shown in Figure 2 and according to the size of the meshes the area of

The Expanded Metal Co, et al } No. 14,
DEFENDANT'S EXHIBIT, Eugene P. Bradford, et al } Oct. Session 1903.
COOMB'S COMPARATIVE DRAWING, NO. I.
GOLDING PATENT, in suit,
No. 527,242

3.

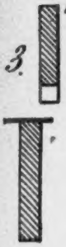
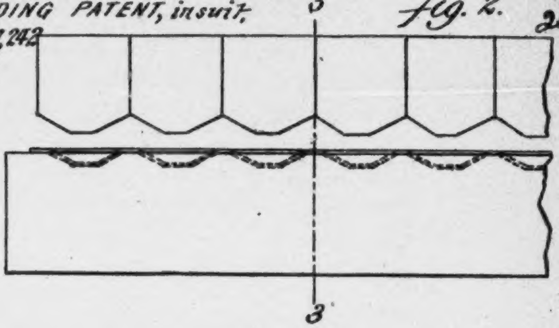


fig. 2.



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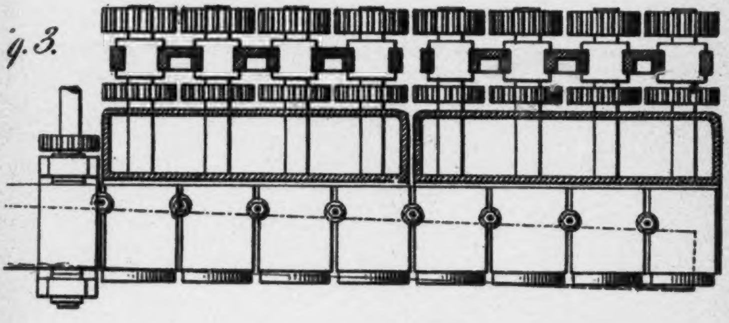

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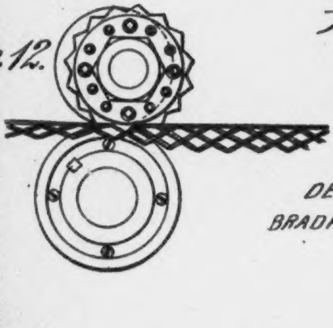
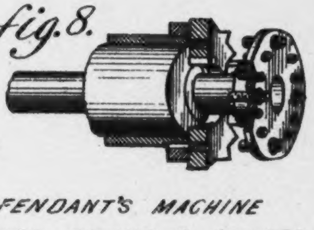


fig. 8.



DEFENDANT'S MACHINE
BRADFORD PATENT, No. 664,379.

John A. Wiedersheim
Examiner.

Expanded Metal Co., et al } No. 14.
vs.
ne S Bradford et al. } April Sessions, 1913:

DEFENDANT'S EXHIBIT, COOMB'S COMPARATIVE DRAWING No. 2.

GOLDING & DURKEE PATENT No. 381,230, OF 1888.

fig. 11.

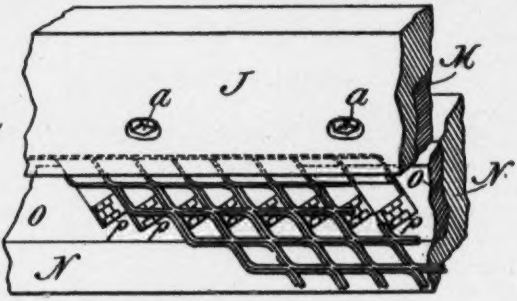

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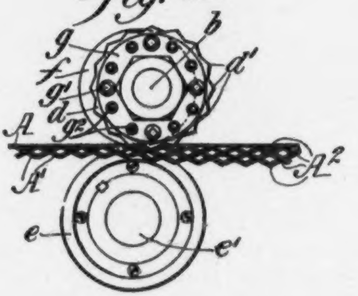
fig. 12.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DEFENDANT'S BRADFORD PATENT, No. 664,379, OF 1900.

John A [illegible]
Examiner

303 United States Circuit Court, Eastern District of Pennsylvania.
In Equity.

No. 14. April Sessions, 1903.

THE EXPANDED METAL CO. ET AL.
vs.
EUGENE S. BRADFORD ET AL.

DEFENDANTS' EXHIBIT FILE WRAPPER PATENT IN SUIT. (Signed) John A. Wiedersheim, Examiner. (Seal.) Commission Expires Jan. 14, 1905.

2-389.

UNITED STATES OF AMERICA,

DEPARTMENT OF THE INTERIOR, PATENT OFFICE.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the Records of this office of the File Wrapper and Contents in the matter of the Letters Patent of John F. Golding, assignor to The Expanded Metal Company, number 527,242, granted October 9, 1894, for Improvement in Method of Making Expanded Sheet Metal.

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the city of Washington this twenty-ninth day of July, in the year of our Lord one thousand nine hundred and four, and of the Independence of the United States of America the one hundred and twenty-ninth.

(Signed) E. B. MOORE,
[SEAL.] *Acting Commissioner of Patents.*

Amount received, $15. Chief Clerk.

304 MAY 4/99.

Hon. Commissioner of Patents, Washington, D. C.

SIR: We herewith enclose the application of John F. Golding for patent in Art of Expanding Sheet Metal & check for $15.00 in payment of 1st Govt. fee.

Very resptly.,

MUNDAY, EVARTS & ADCOCK.

Endorsed: U. S. Patent Office. May 7, 1894. Chief Clerk.

Petition.

To the Commissioner of Patents:

Your petitioner, John F. Golding, a citizen of the United States, residing at Chicago, in the County of Cook, and State of Illinois, prays that Letters Patent be granted to him for the Improvement in the Art of Expanding Sheet Metal set forth in the annexed specification, and he hereby appoints John W. Munday, Edward S. Evarts and Edmund Adcock, composing the firm of Munday, Evarts & Adcock, of No. 217 Adams Express Building, Chicago, Illinois, his attorneys, with full power of substitution, revocation, to prosecute this application, to make alterations and amendments therein, to receive the patent, and to transact all business in the Patent Office connected therewith.

JOHN F. GOLDING.

Specification.

To all whom it may concern:

Be it known that I, John F. Golding, a citizen of the United States, residing in Chicago, in the County of Cook and State of Illinois, have invented a new and useful improvement in the Art of Expanding Sheet Metal, of which the following is a specification:

In the manufacture of what is now generally known as expanded sheet metal, it has been customary to first cut the slits in the sheet metal at short distances apart, and to open the metal at the cuts thus formed by bending the severed portions of strands in a direction at right angles substantially to the plane of the sheet. It has also been made by simultaneously cutting and opening the metal by means of cutters set off or stepped relatively so as to make the slashes or cuts in different lines in the manner set forth in patents No. 381,230 or No. 381,231, of April 17, 1888. In both of these methods the product is somewhat shorter and materially wider than the original sheet, but practically no stretching or elongation of the metal forming the strands is caused.

305 In my present invention I seek to avail myself of the ability of the metal to stretch or distend as well as of its ability to bend under strain or pressure, and the invention consists in the improved method of making expanded metal, viz., by simultaneously cutting and opening or expanding the metal at the cuts by stretching the severed portions.

In the practice of the invention I prefer to make a series of slits in a straight line across the edge of the sheet, at the time of cutting the slits and as a continuation of that operation to depress or stretch the severed metal, *i. e.*, those portions of the sheet lying outside of the cuts, in a direction at right angles to the sheet without any contraction from the length of the original sheet. This operation is then repeated after the sheet has been fed forward, the slits being made opposite the portions unsevered at the previous operation, and so on until the entire sheet is expanded.

My invention allows the use of a single straight under knife, which of course does not need to be shifted in changing the location of the cuts, and the upper cutters are also arranged in a straight line, but their acting edges represent a corrugated form of alternate transverse projections and recesses adapted to coact with the under knife in cut-

COPY BOUND

ting the slits at the proper intervals and to stretch the severed strands. And either the upper cutter or the sheet is shifted back and forth between the operations as will be understood.

In the accompanying drawing Fig. 1 is a perspective of a sheet, a part of which has been expanded by my invention; Fig. 2 is an elevation of the preferred form of cutters used in manufacturing it; Fig. 3 is a section on line 3-3 of Fig. 2; Fig. 4 is a plan of the sheet showing the first line of slits in dotted lines.

In the drawing A represents the sheet from which the expanded metal is formed. B represents the series of upper or moving cutters, and C is the lower knife which may be and preferably is stationary. The lower edges of the cutters B are so shaped as to form alternate transverse projections *b* and recesses or intervening openings *c*, the projecting "portions being adapted to coact with the lower knife in forming the slits. They are also adapted to force or carry downward the severed portions of the metal at the same operation to the position indicated by the broken lines in *m* at Fig. 2. It will be noticed that at the time the bend is imparted to the severed portion, there can be no contraction in the product from the length of the sheet A because the ends of the severed portion or strand are still integral with the sheet and will not permit it. The sheet is then fed forward and the slitting and stretching operation is repeated. One line of slits across the sheet is formed at each operation, and the upper cutters, or the sheet, may be shifted and the sheet be fed forward between the
operations so that the slits are in every case made back of the
306 portions left unsevered at the preceding operation, or in other
words the slits and unsevered portions alternate in position at successive operations.

The bend given to the severed portion, or strands as they are usually called, is in a direction at right angles to the plane of the sheet, and as there is no contraction in the length of the metal, it necessarily follows that the expansion is obtained from the stretch, distention or elongation of the severed strands.

I claim:

I. The improvement in the art of manufacturing expanded metal, consisting in simultaneously slitting the sheet and stretching the severed portions.

JOHN F. GOLDING.

Witnesses:
S. E. CURTIS.
EDW. S. EVARTS.

Oath.

State of Illinois, *County of Cook, ss:*

John F. Golding, the above named petitioner, a citizen of the United States, and resident of Chicago, in the County of Cook and State of Illinois, being duly sworn, deposes and says that he verily believes himself to be the original, first and sole inventor of the improvement in the Art of Making Expanded Sheet Metal, described

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and claimed in the foregoing specification; that the same has not been patented by him, or others with his knowledge or consent in any country; that the same has not to his knowledge been in public use or on sale in the United States for more than two years prior to this application, and he does not know and does not believe that the same was ever known or used prior to his invention thereof.

JOHN F. GOLDING.

Subscribed and sworn to before me this 2nd day of May, A. D. 1894.

LEWIS E. CURTIS,
[NOTARIAL SEAL.] *Notary Public.*

Endorsed: U. S. Patent Office. May 7, 1894. Chief Clerk. Serial No. 510,343. Paper No. ½. Application. Filed May 7, 1894. J. F. Golding.

307 In the United States Patent Office.

No. 510,343.

In the Matter of the Application of JOHN F. GOLDING. Filed May 7, 1894. Art of Making Expanded Sheet Metal.

Hon. Commissioner of Patents.

SIR: I hereby amend the above application by inserting the following claim:

2. The herein described method of making open or reticulated metal work, which consists in simultaneously slitting and stretching portions of a plate or sheet of metal away from the plane of the sheet, and then simultaneously slitting and stretching away from the plane of the sheet subsequent portions of the sheet in places alternate to the first mentioned portions, and by each successive slitting and stretching operation forcing the metal already operated upon further away from the original plane of the sheet, substantially as set forth.

Respectfully submitted,

JOHN F. GOLDING, *Applicant.*

New York June 1st, 1894.

Endorsed: U. S. Patent Office, June 4, 1894. Division XIII. Serial No. 510,343. Paper No. 1. Amendment A. Filed June 4, 1894. J. F. Golding.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE, *June* 18, 1894.
Mailed " " "

John F. Golding, care of Munday, Evarts and Adcock, 217 Adams Ex. Bldg., Chicago, Ill.:

Art of Making Expanded Sheet Metal. May 7, 1894. 510,343.

251.

This case has been examined.

308 Claim I is found to be anticipated by patent to Ohl, No. 475,700, May 24, 1892 (Builders' Hardware).

So far as at present advised claim 2 appears to be allowable.

Claim I is rejected.

WM. H. BLODGETT, *Examiner.*

H. G. V. E.

Endorsed: Serial No. 510,343. Paper No. 2. Rejection dated June 18, 1894. J. F. Golding.

Inventor, John F. Golding.
Invention, Art of Making Expanded Sheet Metal.
Filed May 7, 1894.
No. 510,343.

Room 251.

Hon. Commissioner of Patents.

SIR: I hereby amend the above entitled application by canceling Claim I.

Respectfully submitted,

JOHN F. GOLDING,
By MUNDAY, EVART &
ADCOCK, *Attorneys.*

Washington, D. C. June 20, 1894.

Endorsed: U. S. Patent Office. June 25, 1894. Division XIII. Serial No. 510,343. Paper No. 3. Amendment. Filed June 25, 1894. J. F. Golding.

510,343.

Claim Suggested.

The herein described method of making open or reticulated metal work, which consists in simultaneously slitting and bending portions of a plate or sheet of metal in such manner as to stretch or elongate the bars connecting the slit portions and body of the sheet or plate, and then similarly slitting and bending in places alternate to the first mentioned portions, thus producing the finished expanded sheet metal of the same length as that of the original sheet or plate, substantially as described.

309 DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE, *July* 2, 1894.
Mailed " " "

John F. Golding, care Munday, Evarts and Adcock, 217 Adams Ex. Bldg., Chicago, Ill.:

Art of Making Expanded Sheet Metal. May 7, 1894. 510,343.

251.

The above named case has been reconsidered, and it is thought that the claim does not clearly set forth applicant's invention, nor distinguish the present case from the patent granted applicant June 16, 1885, No. 320,240. The claim is therefore rejected.

It is suggested that applicant adopt the claim enclosed herewith and substitute it for the present claim.

WM. H. BLODGETT, *Examiner.*

C. H. M.

Endorsed: Serial No. 510,343. Paper No. 4. Rejection. Dated July 2, 1894. J. F. Golding.

CHICAGO, *July 5th,* 1894.

Room 251.

Serial No. 510,343. Filed May 7, 1894. Art of Making Expanded Sheet Metal. John F. Golding.

Hon. Commissioner of Patents.

SIR: In the matter of the above application we hereby amend by substituting the following for the claim:

The herein described method of making open or reticulated "metal
"work, which consists in simultaneously slitting and bending
310 "portions of a plate or sheet of metal in such manner as to
"stretch or elongate the bars connecting the slit portions and
" body of the sheet or plate, and then similarly slitting and bending
" in places alternate to the first mentioned portions, thus producing
" the finished expanded sheet metal of the same length as that of the
" original sheet or plate, sugstantially as described."

Very respectfully submitted,

JOHN F. GOLDING,
By MUNDAY, EVARTS & ADCOCK,
His Attorneys.

Endorsed: U. S. Patent Office. July 11, 1894. Division XIII. Serial No. 510,343. Paper No. 5. Amendment B. Filed July 11, 1894. J. F. Golding.

311 Issue Division.

All communications should be addressed to "The Commissioner of Patents, Washington, D. C."

Serial No. 510,343.

Department of the Interior,
United States Patent Office,
Washington, D. C., *July* 13, 1894.

John F. Golding, ass'or, c/o Munday, Evarts & Adcock, 217 Adams Ex. Bldg., Chicago, Ills.

Sir: Your application for a patent for an IMPROVEMENT IN METHOD OF MAKING EXPANDED SHEET METAL, Filed May 7, 1894, has been examined and allowed.

The final fee, twenty dollars, must be paid, and the Letters Patent bear date as of a day not later than SIX MONTHS from the time of this present notice of allowance.

If the final fee is not paid within that period the patent will be withheld, and your only relief will be by a renewal of the application, with additional fees, under the provisions of Section 4897, Revised Statutes. The office aims to deliver patents upon the day of their date, and on which their term begins to run; but to do this properly applicants will be expected to pay their final fees at least TWENTY DAYS prior to the conclusion of the six months allowed them by law. The printing, photolithographing and engrossing of the several patent parts, preparatory to final signing and sealing, will consume the intervening time, and such work will not be done until after payment of the necessary fees.

When you send the final fee you will also send DISTINCTLY AND PLAINLY WRITTEN, the name of the INVENTOR and TITLE OF INVENTION AS ABOVE GIVEN, DATE OF ALLOWANCE (which is the date of this circular), DATE OF FILING, and if assigned, the NAMES OF THE ASSIGNEES.

If you desire to have the patent issue to ASSIGNEES, an assignment containing a REQUEST to that effect, together with the fee for recording the same, must be filed in this office on or before the date of payment of final fee.

Additional copies of specifications and drawings will be charged for at the following rates: Single copies, uncertified, 10 cents
312 each. The money should accompany the order.

Very respectfully,

JOHN S. SEYMOUR,
Commissioner of Patents.

After allowance, and prior to payment of the final fee, applicants should carefully scrutinize the description to see that their statement and language are correct, as mistakes not incurred through the fault of the office, and not affording legal grounds for reissues, will not be corrected after the delivery of the letters patent to the patentee or his agent.

IN REMITTING THE FINAL FEE GIVE THE SERIAL NUMBER AT TH HEAD OF THIS NOTICE.

The within title is that given by the Examiner in charge, as mo appropriate to your invention. Should you desire a change in th same, satisfactory reasons MUST be given therefor on or before th payment of the final fee.

Rec'd Room 31, $2.25.

Amount received, $20. Chief Clerk. Tel.

The Western Union Telegraph Company.

Number	Sent by	Rec'd by	Check
I	CF.		$21 paid.

Received at 11 P. M.
Dated Chicago, Ills., 19th.

To Comm'rs of Patents: SEPT. 19TH, 1894.

We send telegraphic exchange for final fee application five te three four their Golding, filed May seven last, allowed July thirteen

MUNDAY, EVARTS & ADCOCK,

Endorsed: U. S. Patent Office. Sept. 19, 1894. Chief Clerk.

Div. 13.

(Serial Number,)	1894.	(Ex'r's Book,)
510,343.		43 610

Patent No. 527,242.

313 John F. Golding, Ass'or to The Expanded Metal Compan (Corp. of Mo.),
Of Chicago,
County of ——,
State of Illinois.
Invention, Art of Making Expanded Sheet Metal.
Parts of application filed.
(Petition, May 7, 1894.
(Affidavit, " " "
(Specification, " " "
(Drawing, " " "
(Model, none.
(Specimen, none.
(First fee, cash, $15, May 7, 1894.
(" " cert. —.
App. filed complete, May 7-'94.
Examined July 12, 1894. Blodgett, Ex'r.
Countersigned: J. W. Babson, for Commissioner.
7-13-'94.
Notice of allowance, July 13, 1894.

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Final fee, cash, $20, Sept. 19, 1894.
" " cert., —— 189–.
Patented, October 9, 1894.
Munday, Evarts & Adcock, 217 Adams Ex. Bldg., Chicago, Ill.
53 Metal Working, XIII.
Miscellaneous.

M.

1894.

Contents.

½ Application, 2 papers. O. K.
1. Amendment A—June 4, 1894.
2. Rejection—June 18, 1894.
314 3. Amendment—June 25, 1894.
4. Rejection—July 2, 1894.
5. Amendment B—July 11, 1894.
6. Passed—July 12, 1894.
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23.

Title: Improvement in Method of Making Expanded Sheet Metal.

171.

O. W.
F. B. E.

Endorsed: U. S. Patent Office. Copy made July 29, 1904. 136,814/04.

And afterwards, to wit, on the tenth day of January, A. D. 1905, came the parties aforesaid by their counsel aforesaid and this case coming on to be argued sur pleadings and proofs and after having been argued by counsel for the respective parties, the Court not being

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fully advised in the premises takes further time for the consideration of the same.

And afterwards, to wit, on the thirtieth day of March, A. D. 1905, came the parties aforesaid, by their counsel aforesaid, and the Court now being fully advised in the premises renders the following opinion:

315 In the Circuit Court of the United States for the Eastern District of Pennsylvania. In Equity.

April Session, 1903. No. 14.

THE EXPANDED METAL COMPANY and HENRY CHESS, WALTER CHESS, and HARVEY B. CHESS, Co-partners, Trading as Chess Brothers,

vs.

EUGENE S. BRADFORD, JOSEPH C. MILLICHAMP, NICHOLAS J. SCHMUCKER, JR., and NICHOLAS J. SCHMUCKER.

Final Hearing.

HOLLAND, *J.:*

This bill was filed April 30th, 1903, alleging the defendants infringed Letters Patent No. 527,242, for a new and useful improvement in the art of expanding sheet metal, issued to John F. Golding October 9th, 1894; subsequently assigned to the Expanded Metal Company and Chess Brothers under it became exclusive licensees of this patent in Pennsylvania and a number of other States.

The defendants in their answer deny infringement, and allege invalidity of the patent for want of utility, lack of patentable subject matter as a method or process, and anticipation and lack of invention in view of the prior art.

The method of making the old and well known metallic screening in use for a great number of years was described in the Long patent, issued in England in 1862, and the Golding patent, issued in this country in 1884, and was as follows:

"In the manufacture of slashed metallic screening, a blank piece of sheet metal is taken of the required size and thickness, and at intervals it is slashed or cut; the slashes or cuts in each line of the cuts being opposite to the spaces between the slashes or cuts of the adjoining line or lines. These slashes or cuts are made of the required length to form the proper sized meshes. After the metallic sheet is cut or slashed as above described, it is stretched in line transversely to the length of the slashes or cuts, thus forming meshes. The act of stretching causes the metal forming the boundaries of each mesh to take an oblique position, amounting nearly to a perpendicular line, thus presenting the cut edges of the metal to the surface of the screening. Between the ends of the slashes or cuts are spaces of metal uncut which hold the strands or meshes together."

316 The Golding patent, issued in 1884, for this process of manufacturing metallic screening was passed upon by the Circuit

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Court of Missouri, in 1900, and held to be anticipated by the Long patent, issued in England in 1862. Expanded Metal Company *et al.* *vs.* Board of Education *et al.*, 103 Fed. Rep., 287. This finding was sustained by the Circuit Court of Appeals of the Eighth Circuit in 1901, but the patentability of the process was not questioned. 111 Fed. Rep., 395.

By this process of manufacturing expanded metal, the stretching was frequently irregular, and the slashed sheet, while enlarged or expanded in width, was very materially shortened in length, and the product was not a success commercially.

Golding subsequently applied for a patent for a new and useful process for manufacturing slashed metallic screening, and Letters Patent were issued to him in 1885 for this process, which consisted in cutting successive slashes or incisions in the sheet, beginning at one side and near the corner thereof, and pressing the strips thus partially disconnected from the sheet successively away from the sheet in a direction oblique thereto, but otherwise in a plane perpendicular to said sheet, or substantially so, the two operations, as well as the further operation of bending the connected material and giving form and set to the meshes, being effected by the simultaneous operations of slashing and pressing. By this method, however, the expanded product is shortened in length to the extent of fifteen or twenty per cent. The meshes are not at right angles to each other, and the sheet, when expanded, is of an irregular form, and could not be economically and conveniently used in square iron frames without a waste of material and cutting through the meshes in fitting it to such a shaped frame. Commercially, this product was a little more successful than its predecessor.

In 1894, Golding applied for a patent for a new and useful improvement in the art of expanding sheet metal, and the patent in suit was issued to him, wherein he described the process as follows:

> "In the manufacture of what is now generally known as expanded sheet metal, it has been customary to first cut the slits in the sheet metal at short distances apart, and to open the metal at the cuts thus formed by bending the severed portions or strands in a direction at right angles substantially to the plane of the sheet. It has also been made by simultaneously cutting and opening the metal by means of cutters set off or stepped relatively so as to make the slashes or cuts in different lines in the manner set forth in Patents No. 381,230 or No. 381,231, of April 17, 1888. In both of these methods the product is somewhat shorter and materially wider than the original sheet, but practically no stretching or elongation of the metal forming the strands is caused.
>
> 317 In the present invention I seek to avail myself of the ability of the metal to stretch or distend as well as its ability to bend under strain or pressure, and the invention consists in the improved method of making expanded metal, viz.: by simultaneously cutting and opening or expanding the metal at the cuts by stretching the severed portions.
>
> In the practice of the invention I prefer to make a series of slits in a straight line across the edge of the sheet and at the time of cut-

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ting the slits and as a continuation of that operation to depress or stretch the severed material, *i. e.,* those portions of the sheet lying outside of the cuts, in a direction at right angles to the sheet, without any contraction from the length of the original sheet. This operation is then repeated after the sheet has been fed forward, the slits being made opposite to the portions unsevered at the previous operation, and so on until the entire sheet is expanded.

My invention allows the use of a single straight under knife, which of course does not need to be shifted in changing the location of the cuts, and the upper cutters are also arranged in a straight line, but their acting edge- represent a corrugated form of alternate transverse projections and recesses adapted to coact with the under knife in cutting the slits at the proper intervals and to stretch the severed strands and either the upper cutter or the sheet is shifted back and forth between the operations as will be understood.

In the accompanying drawings Figure i is a perspective of a sheet, a part of which has been expanded by my invention. Fig. 2 is an elevation of the preferred form of cutters used in manufacturing it. Fig. 3 is a section on line 3-3 of Fig. 2. Fig. 4 is a plan of the sheet showing the first line of slits in dotted lines.

In the drawings A represents the sheet from which the expanded metal is formed.

B represents the series of upper or moving cutters and C is the lower knife which may be and preferably is stationary. The lower edges of the cutters B are so shaped as to form alternate transverse projections *b,* and recesses or intervening openings *c,* the projecting portions being adapted to coact with the lower knife in forming the slits. They are also adapted to force or carry downward the severed portions of the metal at the same operation to the position indicated by the broken lines *m* at Fig. 2. It will be noticed that at the time the bend is imparted to the severed portion, there can be no contraction in the product from the length of the sheet A because the ends of the severed portion or strand are still integral with the sheet and will not permit it. The sheet is then fed downward and the slitting and stretching operation is repeated. One line of slits across the sheet is formed at each operation, and the upper cutters, or the sheet, may be shifted and the sheet fed forward between the operations so that the slits are in every case made back of the portions left unsevered by the preceding operation, or in other words, the
318 slits and unsevered portions alternate in position at successive
operations. The bend given to the severed portion, or strands as they are usually called, is in a direction at right angles to the plane of the sheet, and as there is no contraction in the length of the metal, it necessarily follows that the expansion is obtained from the stretch, distension or elongation of the severed strands.

I claim

The herein described method of making open or reticulated metal work, which consists in simultaneously slitting and bending portions of a plane or sheet of metal in such a manner as to stretch or elongate the bars connecting the slit portions and body of the sheet or plate, and then similarly slitting and bending in places alternate to

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the first mentioned portions, thus producing the finished expanded sheet metal of the same length as that of the original sheet or plate, substantially as described."

The open or reticulated metal work made by this process accomplishes something entirely new. By this novel process Golding was able to expand his metal into a reticulated metal work, and produce an expanded sheet of the same length as the ordinary blank metal plate. It was stronger, and the meshes regular in form and appearance, and exactly at right angles with each other; a line through the intersection of the meshes in one direction is exactly at right angles with the line drawn through the intersection in the other direction. From this it results that the expanded sheet is not only regular in form and appearance, but has the maximum possible strength afforded by the thickness of the metal and size of the mesh, and as a commercial product it can be put to many additional uses than the slash metallic screening theretofore manufactured. This process is a new and useful method not theretofore known or used in the prior art. It is a mode of treatment of metal as distinguished from the machinery or means by which the result is accomplished. In the language of the patent law, it is an art, and just as patentable as a piece of machinery. Cochrane *vs.* Deener, 94 U. S., 780; Tilghman *vs.* Proctor, 102 U. S., 707.

While I am of the opinion that the process is patentable, yet it does not follow that the making of a machine such as that invented by the defendants is an infringement of the plaintiff's patent. One may discover a new and useful process by which metal may be expanded, irrespective of any particular form of machinery or mechanical device; and another may invent a labor saving machine by which this operation or process may be performed, and each may be entitled to his patent. Corning *vs.* Burden, 56 U. S., 252. There is no claim in the plaintiff's patent for any particular machine by which this process of expanding metal is accomplished, and we see no reason why the means of performing the process patented by
319 the plaintiff cannot be embodied in a machine and patented by the defendants. Cochran *vs.* Deener, *supra.* So that in so far as the plaintiff's bill relies upon the mere creation of the machine by the defendant to perform the process which he has patented, as an infringement it must fail, as the defendants would have a right to construct and patent such a machine. It is entirely separate and apart from the process which the machine is intended to accomplish. Robinson on Patents, Secs. 904 and 925. The evidence, however, is that the defendants infringed the plaintiff's patent in using his process, and expanding metal, to some extent, was produced by their machine by the same process covered by the defendants' patent and without their permission. To that extent the rights of the plaintiffs in the patent in suit were infringed. The metal manufactured under the process of the plaintiffs' patent was produced here in Philadelphia prior to the bringing of this suit, and whether it was produced by a perfect machine or not can make no difference. The patented process was used and the infringement complete.

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The plaintiffs' bill is therefore sustained and a perpetual injun tion awarded.

Endorsed: No. 14. April Sess., 1903. U. S. C. C. In Equit The Expanded Metal Co. *et al. vs.* Eugene S. Bradford *et al.* Opi ion of Court sustaining bill and awarding perpetual injunctio Filed March 30, 1905. Samuel Bell, Clerk.

At the April Sessions of the Circuit Court of the United States f the Eastern District of Pennsylvania, held at Philadelphia, c the Sixth Day of April, 1905.

Present: The Hon. J. B. Holland, J.

In Equity.

April Session, 1903. No. 14.

The Expanded Metal Company and Henry Chess, Walte Chess, and Harvey B. Chess, Co-partners, Trading as Che Brothers,

vs.

Eugene S. Bradford, Joseph C. Millichamp, Nicholas Schmucker, Jr., and Nicholas J. Schmucker.

320 *Decree.*

This cause having come on to be heard on the pleadings and proo and having been argued by Ernest Howard Hunter, Esq., for t complainants, and by E. Hayward Fairbanks, Esq., for the defen ants, and the Court having duly considered the same:

It is ordered, adjudged and decreed that the Letters Patent N 527,242, granted October 9, 1894, to the Expanded Metal Compa as the assignee of John F. Golding, is a good and valid patent, a that the said John F. Golding was the original and first inventor the method of making expanded sheet metal which is described a claimed in the said patent, and that said Expanded Metal Compan one of the complainants is the owner of the said Letters Patent a of all rights secured thereby, and that Henry Chess, Walter Che and Harvey B. Chess, composing the firm of Chess Brothers, a the exclusive licensees under the said Letters Patent for the Stat of New York, Pennsylvania, New Jersey, Delaware, West Virgin and Ohio.

It is further ordered, adjudged and decreed that the defendan have infringed upon the said Letters Patent and upon the exclusi rights of the complainants therein.

And it is further ordered, adjudged and decreed that the complai ants do recover of the defendants, the profits, gains, and advantag which the said defendants or any of them have received or made, which have arisen or accrued to them or any of them from said i fringement, and any and all damages which the complainants ha

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suffered or sustained by reason of said infringement, since the date of the said Letters Patent; and this cause is referred to —— —— as a Master of this Court to ascertain, take and report to the Court an account of the gains, profits and advantages which the defendants or any of them have received, or which have arisen or accrued to them or any of them from said infringement, and also the damages that may have been suffered by the complainants on account of said infringement, and that on said accounting the complainants shall have the right to cause the examination of the defendants and each of them, their agents, servants and employees, and also to the production of the books, vouchers and documents of each of the said defendants, and that said defendants attend for such purpose before the Master from time to time as said Master shall direct.

It is further ordered, adjudged and decreed that a perpetual injunction be issued in this suit against the said defendants according to the prayer of this bill, and that the complainants do recover of the defendants their costs, charges and disbursements to be taxed.

By THE COURT.

321 Attest:

GEORGE BRODBECK, JR.,
Pro Clerk.

Endorsed: In the Circuit Court of the United States, Eastern District of Pennsylvania. April Term, 1903. No. 14. In Equity. The Expanded Metal Company and Henry Chess, Walter Chess and Harvey B. Chess, co-partners, trading as Chess Brothers, *vs.* Eugene S. Bradford, Joseph Millichamp, Nicholas J. Schmucker, Jr., and Nicholas J. Schmucker. Decree. Filed April 6th, 1905. Samuel Bell, Clerk. Ernest Howard Hunter, No. 926 Walnut street, Philadelphia, Pa.

United States Circuit Court, Eastern District of Pennsylvania. In Equity.

No. 14. April Sessions, 1903.

THE EXPANDED METAL COMPANY and HENRY CHESS, WALTER CHESS, and HARVEY B. CHESS, Co-partners, Trading as Chess Brothers, Complainants,

vs.

EUGENE S. BRADFORD, JOSEPH C. MILLICHAMP, NICHOLAS J. SCHMUCKER, JR., and NICHOLAS J. SCHMUCKER, Respondents.

On this — day of April, 1905, on motion of E. Hayward Fairbanks, Esq., counsel for defendants, it is ordered that the injunction this day granted in the above entitled case be suspended until the determination of the appeal herein, upon the following conditions:

1st. The defendants to take and perfect its appeal within fifteen days hereof and claim preference at the ensuing term of Court for the Circuit Court of Appeals for the Third Circuit.

2d. Defendants to file a bond satisfactory to this Court in the sum of five hundred dollars (500) with leave to the complainants to move

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to increase the amount of said bond at any time to cover any dama
caused by the infringement of said Letters Patent by the defenda
while the injunction is suspended, and to file with the Clerk of t
Court monthly written verified statements of the amount of expand
metal complained of herein, to whom sold, the date of sale and t
price received.

——— ———,
U. S. Judge.

322 Endorsed: United States Circuit Court, Eastern District
Pennsylvania. In Equity. April Sessions, 1903. No.
The Expanded Metal Company and Henry Chess, Walter Chess a
Harvey B. Chess, co-partners, trading as Chess Brothers, *vs.* Euge
S. Bradford, Joseph C. Millichamp, Nicholas J. Schmucker, Jr., a
Nicholas J. Schmucker. Order suspending injunction. Moti
refused for reasons within stated. (Signed) Holland, J. Fil
April 12, 1905. Samuel Bell, Clerk. E. Hayward Fairbanks, f
defendants.

United States Circuit Court, Eastern District of Pennsylvania.
Equity.

No. 14. April Sessions, 1903.

THE EXPANDED METAL COMPANY ET AL.,
vs.
EUGENE S. BRADFORD ET AL.

Now to wit, April 12th, 1905, the motion to suspend the inju
tion is refused. In this case the defendants asserted at the heari
that their machine was not in condition to manufacture expand
metal and had been dismantled and shipped out of this district, a
that they had ceased the manufacture of expanded metal. There
therefore no necessity for a suspension of the injunction.

By the Court.

JAMES B. HOLLAND, *J.*

UNITED STATES OF AMERICA, *ss.*

EASTERN DISTRICT OF PENNSYLVANIA, *ss:*

The President of the United States to Eugene S. Bradford, Joseph
Millichamp, Nicholas J. Schmucker, Jr., and Nicholas
Schmucker, Greeting:

Whereas the Expanded Metal Company and Henry Chess, Walt
Chess and Harvey B. Chess, co-partners, trading as Chess Brothe
lately exhibited their bill of complaint in the Circuit Court of t
United States for the Eastern District of Pennsylvania, in the Thi
Circuit, against you as defendants, praying to be relie
323 touching the matters herein complained of, and especial
that you and each of you, and all acting under you might

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restrained from further infringing the patent and the rights of the complainant in the premises, in said bill mentioned, in any manner contrary to law or equity. We therefore in consideration thereof and also of the particular matters in the said bill set forth do strictly command and enjoin you, the said Eugene S. Bradford, Joseph C. Millichamp, Nicholas J. Schmucker, Jr., and Nicholas J. Schmucker, and each of you, your servants, agents and workmen and all others acting under or with you, that from henceforth you do absolutely desist and refrain from the further use in any manner, directly or indirectly, of any method of making expanded sheet metal employing or embracing the method, art or process described in the Letters Patent of the United States No. 527,242, dated October 9th, 1894, and issued to the Expanded Metal Company, as particularly recited in the claim thereof, to wit:

"The herein described method of making open or reticulated metal work, which consists in simultaneously slitting and bending portions of a plate or sheet of metal in such manner as to stretch or elongate the bars connecting the slit portions and body of the sheet or plate, and then similarly slitting and bending in places alternate to the first mentioned portions, thus producing the finished expanded sheet metal of the same length as that of the original sheet or plate, substantialy as described," referred to in the said bill of complaint and in the affidavit thereto annexed.

Witness the Honorable Melville W. Fuller, Chief Justice of the Supreme Court of the United States at Philadelphia, this 15th day of April, 1905, and of the Independence of the United States the one hundred and twenty-ninth.

(Signed) GEORGE BRODBECK, Jr.,
[COURT SEAL.] *Pro Clerk.*

Endorsed: In the Circuit Court of the United States, Eastern District of Pennsylvania, April Term, 1903. No. 14. In Equity. The Expanded Metal Company and Henry Chess, Walter Chess and Harvey B. Chess, co-partners, trading as Chess Brothers, *vs.* Eugene S. Bradford, Joseph C. Millichamp, Nicholas J. Schmucker, Jr., and Nicholas J. Schmucker. Injunction. Filed April 17, 1905. Samuel Bell, Clerk. Ernest Howard Hunter, No. 926 Walnut street, Philadelphia, Pa.

On the 17th day of April, 1905, personally appeared Abram B.
Myers, Deputy United States Marshal, and made oath that he served
the within injunction on Nicholas J. Schmucker, Jr., and
324 Nicholas J. Schmucker, by giving to each respectively a true
and attested copy thereof, and making known the contents
of the same to them on the 15th day of April, 1905, and as to
Eugene S. Bradford and Joseph C. Millichamp, not found in the
District.

ABRAM B. MYERS,
Deputy U. S. Marshal.

Before me,
HENRY B. ROBB,
Deputy Clerk.
19—713

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United States Circuit Court, Eastern District of Pennsylvania.
In Equity.

April Sessions, 1903. No. 14.

THE EXPANDED METAL COMPANY and HENRY CHESS, WALT
CHESS, and HARVEY B. CHESS, Co-partners, Trading as Ch
Brothers,

vs.

EUGENE S. BRADFORD, JOSEPH C. MILLICHAMP, NICHOLAS
SCHMUCKER, JR., and NICHOLAS J. SCHMUCKER.

And now, April 18th, 1905, come Eugene S. Bradford, Joseph
Millichamp, Nicholas J. Schmucker and Nicholas J. Schmucker, J
defendants and appellants, and say that in the proceedings of t
said Court in the above-entitled case and in the decretal order
injunction made and entered herein on the 6th day of April, 19
there are manifest errors, *inter alia.*

1. The Circuit Court erred in entering an interlocutory dec
sustaining the validity of the claim of Letters Patent No. 527,2
of October 9th, 1894, and finding the defendants to have infring
that claim and ordering an injunction to issue against them.

2. The Circuit Court erred in sustaining the prayers of the
of complaint.

3. The Circuit Court erred in holding that the claim of the Go
ing patent in suit was valid and disclosed patentable novelty, n
withstanding the prior art evidence in the record.

325 4. The Circuit Court erred in holding that the claim
the Golding patent in suit was valid and disclosed patenta
novelty notwithstanding the prior British patent to Johnston,
11,332 September 23, 1885, and United States patents to Hol,
415,700, May 24, 1892; Golding, No. 381,231, April 17, 1888, a
Golding & Durkee patent, No. 381,230, April 17, 1888.

5. The Circuit Court erred in holding a claim to be function o
machine to constitute patentable subject-matter.

6. The Circuit Court erred in its finding that "This process i
new and useful method not heretofore known or used in the pr
art. * * * In the language of the patent law it is an art a
just as patentable as a piece of machinery."

7. The Circuit Court erred in adjudging that the experimen
use of defendants' unfinished machine constituted an infringi
act, there being no sufficient evidence to warrant such finding
fact.

8. The Circuit Court erred in adjudging that the mechanical st
existent during the operation of the defendants' machine whi
produced a product of greater length than the original blank, w
substantially the same as the mechanical steps of the claim in s
there being no sufficient evidence to warrant such finding of fa

9. The Circuit Court erred in adjudging, without any sufficie

evidence, to warrant the finding as a conclusion of fact, and without giving any weight to defendants' patent as evidence to the contrary, that the operation of the defendants' machine involved the employment of the mechanical steps recited in the claim of the patent in suit.

Wherefore the said defendants and appellants pray that the said decretal order awarding an injunction against them be reversed and that the said Circuit Court may be directed by the mandate of this Court to set aside the same.

E. HAYWARD FAIRBANKS,
Of Counsel with Defendants-Appellants.

Endorsed: United States Circuit Court, Eastern District of Pennsylvania. In Equity. April Sessions, 1903. No. 14. The Expanded Metal Company and Henry Chess, Walter Chess and Harvey B. Chess, co-partners, trading as Chess Brothers, *vs.* Eugene S. Bradford, Joseph C. Millichamp, Nicholas J. Schmucker, Jr., and Nicholas J. Schmucker. Assignments of Error. E. Hayward Fairbanks, for defendants.

326 *Petition for Appeal.*

In Equity.

April Sessions, 1903. No. 14.

THE EXPANDED METAL COMPANY and HENRY CHESS, WALTER CHESS, and HARVEY B. CHESS, Co-partners, Trading as Chess Brothers,

vs.

EUGENE S. BRADFORD, JOSEPH C. MILLICHAMP, NICHOLAS J. SCHMUCKER, JR., and NICHOLAS J. SCHMUCKER.

Eugene S. Bradford, Joseph C. Millichamp, Nicholas J. Schmucker, Sr., and Nicholas J. Schmucker, Jr., defendants in the above-entitled cause, considering themselves aggrieved by the order made the 6th day of April, 1905, and entered herein, on the 6th day of April, 1905, wherein and whereby it was ordered that an injunction be and thereby was granted and ordered to issue out of and under the seal of this Court, enjoining and restraining the defendants, Eugene S. Bradford, Joseph C. Millichamp, Nicholas J. Schmucker, Sr., and Nicholas J. Schmucker, Jr., and their and each of their officers, agents, attorneys and workmen, from manufacturing expanded metal embodying or containing the invention described and claimed in United States Letters Patent No. 527,242, granted October 9th, 1894, until the further order of this Court, come now by E. Hayward Fairbanks, their solicitor, and petition this Court for an order allowing them, the defendants, to prosecute an appeal from said order granting said injunction to the Honorable, the United States Circuit Court of Appeals, for the Third Circuit, under and according to the laws of the United States in that behalf made and provided.

And your petitioners will ever pray.

(Signed) E. HAYWARD FAIRBANKS,
Of Counsel with Defendants.

Allowed.
By THE COURT.

Attest:
GEORGE BRODBECK, JR.,
Pro Clerk.

April 18th, 1905.

327 Endorsed: United States Circuit Court, Eastern District of Pennsylvania. In Equity. April Sessions, 1903. No. 14. The Expanded Metal Company and Henry Chess, Walter Chess and Harvey B. Chess, co-partners, trading as Chess Brothers, *vs.* Eugene S. Bradford, Joseph C. Millichamp, Nicholas J. Schmucker, Jr., and Nicholas J. Schmucker. Petition for Appeal. E. Hayward Fairbanks, for Defendants. Filed April 18th, 1905. Samuel Bell, Clerk.

Order Allowing Appeal.

At a stated Term of the Circuit Court of the United States for the Eastern District of Pennsylvania, held in the Court Room of the Post Office Building, in the City of Philadelphia, State of Pennsylvania, on the 8th Day of April, A. D. 1905.

Present: Hon. J. B. Holland, Judge.

In Equity.

April Sessions, 1903. No. 14.

THE EXPANDED METAL COMPANY and HENRY CHESS, WALTER CHESS, and HARVEY B. CHESS, Co-partners, Trading as Chess Brothers,

vs.

EUGENE S. BRADFORD, JOSEPH C. MILLICHAMP, NICHOLAS J. SCHMUCKER, JR., and NICHOLAS J. SCHMUCKER.

Eugene S. Bradford, Joseph C. Millichamp, Nicholas J. Schmucker, and Nicholas J. Schmucker, Jr., the defendants in the above-entitled cause, having presented and filed their petition for an order allowing an appeal to the United States Circuit Court of Appeals for the Third Circuit, from the order granting an injunction against the defendants in this cause, and having filed with said petition, the assignment of errors, on motion of E. Hayward Fairbanks, solicitor for the defendants in this cause, it is

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Ordered that an appeal to the United States Circuit Court of Ap-
eals for the Third Circuit from the order made the 6th day of April,
905, granting an injunction against the defendants in this cause
e and is hereby allowed; appeal bond to be entered in the sum of
five hundred ($500.00) dollars, and upon the entry thereof,
328 it is further ordered that a transcript of the record and pro-
ceedings in this Court be certified to the said Circuit Court of
ppeals according to law and a citation issued accordingly.

By The COURT.

Attest:
GEORGE BRODBECK, Jr.,
Pro. Clerk.

NITED STATES OF AMERICA, *ss:*

The President of the United States to the Expanded Metal Company and Henry Chess, Walter Chess, and Harvey B. Chess, co-partners, trading as Chess Brothers, Greeting:

You are hereby cited and admonished to be and appear at a United tates Circuit Court of Appeals for the Third Circuit, to be holden t the City of Philadelphia within thirty days, pursuant to an appeal iled in the Clerk's office of the Circuit Court of the United States, astern District of Pennsylvania, wherein Eugene S. Bradford, oseph C. Millichamp, N. J. Schmucker, Jr., and N. J. Schmucker, re appellants and you are appellees, to show cause, if any there be, hy the decree rendered against the said appellants as in the said ppeal mentioned, should not be corrected, and why speedy justice hould not be done to the parties in that behalf.

Witness, the Honorable James B. Holland, Judge holding Circuit ourt of the United States this 18th day of April, in the year of our ord one thousand nine hundred and five.

By The COURT.

Attest:
GEORGE BRODBECK, Jr.,
Pro. Clerk.

Service accepted.
ERNEST HOWARD HUNTER,
Attorney for Appellees.

UNITED STATES OF AMERICA, *ss:*

ASTERN DISTRICT OF PENNSYLVANIA, *ss:*

The President of the United States to Eugene S. Bradford, Joseph C. Millichamp, Nicholas J. Schmucker, Jr., and Nicholas J. Schmucker, Greeting:

29 Whereas, the Expanded Metal Company and Henry Chess,
Walter Chess and Harvey B. Chess, co-partners, trading as
hess Brothers, lately exhibited their bill of complaint in the Circuit
ourt of the United States for the Eastern District of Pennsylvania,

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in the Third Circuit, against you as defendants, praying to be r
touching the matters therein complained of, and especially th
and each of you, and all acting under you might be restrained
further infringing the patent and the rights of the complain
the premises, in said bill mentioned, in any manner contrary
or equity. We therefore in consideration thereof and also
particular matter in the said bill set forth do strictly comman
enjoin you, the said Eugene S. Bradford, Joseph C. Millich
Nicholas J. Schmucker, Jr., and Nicholas J. Schmucker, and ea
you, your servants, agents and workmen, and all others acting
or with you, that from henceforth you do absolutely desist a
frain from the further use in any manner, directly or indirect
any method of making expanded sheet metal employing or en
ing the method, art or process described in the Letters Patent
United States No. 527,242, dated October 9th, 1894, and issu
the Expanded Metal Company, as particularly recited in the
thereof, to wit:

“ The herein described method of making open reticulated
“ work, which consists in simultaneously slitting and bendin
“ tions of a plate or sheet of metal in such manner as to stre
“ elongate the bars connecting the slit portion and body of the
“ or plate, and then similarly slitting and bending in places alt
“ to the first mentioned portions, thus producing the finishe
“ panded sheet metal of the same length as that of the origina
“ or plate, substantially as described,”

referred to in the said bill of complaint and in the affidavit t
annexed.

Witness, the Honorable Melville W. Fuller, Chief Justice
Supreme Court of the United States, at Philadelphia, this — d
April, 1905, and of the Independence of the United States th
hundred and twenty-ninth.

Endorsed: U. S. Marshal's No. 21.79. In the Circuit Co
the United States. Eastern District of Pennsylvania. April
1903. No. 14. In Equity. The Expanded Metal Co. *et a*
Bradford *et al.* Injunction. Ernest Howard Hunter, Attorn
Law, Philadelphia, Pa. Filed April 24, 1905. Samuel Bell,

UNITED STATES OF AMERICA,
Northern District of Ohio, ss:

U. S. Marshal's Return.

Received this writ at Cleveland, Ohio, April 17, 1905
330 on the same day at Canton, Ohio, I served the same o
within named Eugene S. Bradford by delivering to him
sonally a true and certified copy hereof with all the endorse
thereon.

F. M. CHANDLER,
U. S. Mars
By F. M. FANNING, *Dep*

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Fees.

Service	$2 00
Travel	3 72
	$5 72

STATE OF OHIO, *County of Cuyahoga, ss:*

In re THE EXPANDED METAL CO. ET AL.
vs.
BRADFORD ET AL.

On this 18th day of April, 1905, before me came F. M. Fanning, Deputy United States Marshal of Cleveland, in the County of Cuyahoga and State of Ohio, and makes oath, and says that he did, on Monday, the 17th day of April, A. D. 1905, personally serve Eugene S. Bradford, of Canton, in the County of Stark and State of Ohio, with a true copy of the hereto annexed injunction, by delivering the same to him; and he further makes oath and says that he is not interested in the case named in said injunction.

F. M. FANNING.

Subscribed and sworn to before me this 18th day of April, A. D. 1905.

[SEAL.]

E. H. ROBERTS,
Notary Public in and for said County.

Bond.

Know all men by these presents, that we, Eugene S. Bradford, Joseph C. Millichamp, Nicholas J. Schmucker, Jr., and Nicholas J. Schmucker, of Philadelphia, as principals, and Fidelity & Deposit Company, of Maryland, as sureties, are held and firmly bound unto the Expanded Metal Company and Henry Chess, Walter Chess and Harvey B. Chess, co-partners, trading as Chess Brothers, in the full and just sum of five hundred dollars ($500.00), to be paid to the said the Expanded Metal Company, and Henry Chess, Walter Chess and Harvey B. Chess, co-partners, trading as Chess Brothers, their certain attorney, successors or assigns, to which payment well and truly to be made, we bind ourselves, our heirs, executors and administrators, jointly and severally, by these presents.

331 Sealed with our seals and dated this 27th day of April, in the year of our Lord one thousand nine hundred and five.

Whereas, lately at a session of the United States Circuit Court for the Eastern District of Pennsylvania, at Philadelphia, Pa., on April 6th, 1905, in a suit depending in said Court, between the Expanded Metal Company, Henry Chess, Walter Chess and Harvey N. Chess, co-partners, trading as Chess Brothers, and Eugene S. Bradford, Joseph C. Millichamp, Nicholas J. Schmucker, Jr., and Nicholas J. Schmucker, in equity, April Sessions, 1903, an injunction was rendered against the said Eugene S. Bradford, Joseph C. Milli-

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champ, Nicholas J. Schmucker, Jr., and Nicholas J. Schmucker, enjoining them and each of them, their officers, agents, attorneys and workmen from infringing upon the claim of Letters Patent No. 527,242, and the said Eugene S. Bradford, Joseph C. Millichamp, Nicholas J. Schmucker, Jr., and Nicholas J. Schmucker, having obtained an order allowing an appeal, and filed a copy thereof in the Clerk's office of the said Court, to reverse the decree in the aforesaid suit, and a citation directed to the said the Expanded Metal Company, and Henry Chess, Walter Chess and Harvey B. Chess, copartners, trading as Chess Brothers, and Ernest Howard Hunter, their solicitor, citing and admonishing them to be and appear at a United States Circuit Court of Appeals, for the Third Circuit, to be holden at the City of Philadelphia within thirty days.

Now, the condition of the above obligation is such, that if the said Eugene S. Bradford, Joseph C. Millichamp, Nicholas J. Schmucker, Jr., and Nicholas J. Schmucker, shall prosecute the appeal to effect and answer all damages and costs if they fail to make their plea good, then the above obligation to be void; else to remain in full force and virtue.

Sealed and delivered in the presence of——

The signature of the principals in this bond are hereby waived by the surety.

FIDELITY & DEPOSIT CO. OF MD.
By HERMAN HOOPES, [SEAL.]
Res. Vice-President.

Attest:
F. E. TOWNSEND,
Assistant Secretary.

Approved.
By THE COURT.

Attest:
GEORGE BRODBECK, JR.

April 28, 1905.

332 Endorsed: 14. April Sess., 1903. U. S. C. C., E. D. of Pa. Expanded Metal Co. *vs.* Bradford *et al.* Bond sur Appeal. Filed April 28, 1905. Samuel Bell, Clerk.

In the Circuit Court of the United States, for the Eastern District of Pennsylvania. In Equity.

April Sessions, 1903. No. 14.

THE EXPANDED METAL COMPANY ET AL.
vs.
EUGENE S. BRADFORD ET AL.

To the clerk of the above court:

You are hereby directed in making up the Transcript of Record sur Appeal in the above-entitled case to include the following papers and no others:

COPY BOUND

Docket Entries.
Caption.
Subpœna.
Complainant's Record, including Exhibits.
Defendant's Record, including Exhibits.
File Wrapper and Contents.
Opinion of Court.
Decree.
Motion to suspend Injunction, and order of refusal.
Injunctions.
Assignments of Error.
Petition for Appeal.
Order allowing Appeal.
Citation.
Bond sur Appeal.
Copy of this Præcipe.
Clerk's Certificate.

E. HAYWARD FAIRBANKS,
Attorney for Appellants.

333 UNITED STATES OF AMERICA,
Eastern District of Pennsylvania, sct:

I, Samuel Bell, Clerk of the Circuit Court of the United States of America for the Eastern District of Pennsylvania, in the Third Circuit, do hereby certify the foregoing to be a true and faithful copy of the original pleas and proceedings in the case of the Expanded Metal Co. and Henry Chess, Walter Chess and Harvey B. Chess, co-partners, trading as Chess Brothers, *vs.* Eugene S. Bradford, Joseph C. Millichamp, Nicholas J. Schmucker, Jr., and Nicholas J. Schmucker, No. 14, April Term, 1903, in Equity, as per præcipe filed, a copy of which is hereto attached, on file and now remaining among the records of the said Court, in my office.

In testimony whereof, I have hereunto subscribed my name and affixed the seal of the said Court at Philadelphia, this 4th day of May, in the year of our Lord one thousand nine hundred and five, and of the Independence of the United States the one hundred and twenty-ninth.

SAMUEL BELL,
Clerk of C. C.

[SEAL.]

334 And afterwards to wit on the 6th. day of March A. D. 1906, this case being called for argument on the transcript of record from the Circuit Court of the United States for the Eastern District of Pennsylvania, before Hon. George M. Dallas, and Hon. George Gray, Circuit Judges and Hon. *Hon.* John B. McPherson, District Judge, and being argued by counsel for the respective parties and the court not fully advised in the premises takes further time for consideration thereof.

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And afterwards to wit on the tenth day of September A. D. 190 comes the parties aforesaid by their counsel aforesaid and the cou now being fully advised in the premises render the following opinio to wit:

In the United States Circuit Court of Appeals for the Third Circuit

E. S. Bradford, J. C. Millichamp, N. J. Schmucker, Jr., and N. J
Schmucker, Appellants,
vs.
The Expanded Metal Company and Henry Chess, Walter Chess
and Harvey B. Chess, Partners as Chess Brothers, Appellees.

Before Dallas and Gray, Circuit Judges, and McPherson, Distric
Judge.

Dallas, *Circuit Judge:*

The Expanded Metal Company and Chess Brothers, the company' exclusive licensees in the state of Pennsylvania, were the complainants below, and charged the appellants with infringing letters paten No. 527,242, issued in October, 1894, for an invention made by Joh F. Golding and assigned to the Metal Company before the letters wer actually issued. The subject of the invention, as declared in th specification, is "a new and useful improvement in the art of expanding sheet metal;" and the precise improvement which the
335 applicant asserted that he had made was the simultaneous cutting and opening, or expanding, the metal at the cuts b stretching the severed portions. In other words, he applied for patent upon a method of manufacture, and, as will appear from th specification, which we are about to quote, he distinctly limited th novelty of his method to the stretching of the severed portion at th time when the metal was cut and the slits were opened. The specification refers to the prior art, and to the applicant's proposed improvement, in the following language:

"In the manufacture of what is now generally known as expande sheet metal, it has been customary to first cut the slits in the shee metal at short distances apart, and to open the metal at the cuts thu formed by bending the severed portions or strands in a direction a right angles substantially to the plane of the sheet. It has also bee made by simultaneously cutting and opening the metal by means o cutters set off, or stepped relatively so as to make the slashes or cuts i different lines in the manner set forth in patents No. 381,230 or No 381,231, of April 17, 1888. In both of these methods the product i somewhat shorter and materially wider than the original sheet, bu practically no stretching or elongation of the metal forming th strands is caused.

In my present invention I seek to avail myself of the ability of th metal to stretch or distend as well as of its ability to bend under strai or pressure, and the invention consists in the improved method o making expanded metal, viz., by simultaneously cutting and openin or expanding the metal at the cuts by stretching the severed portions.

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In the practice of the invention I prefer to make a series of slits in a straight line across the edge of the sheet, and at the time of cutting the slits, and as a continuation of that operation, to depress or stretch the severed metal, *i. e.*, those portions of the sheet lying out-
side of the cuts, in a direction at right angles to the sheet,
336 without any contraction for the length of the original sheet.
This operation is then repeated after the sheet has been fed forward, the slits being made opposite the portions unsevered at the previous operation, and so on until the entire sheet is expanded.

My invention allows the use of a single straight under knife, which of course does not need to be shifted in changing the location of the cuts, and the upper cutters are also arranged in a straight line, but their acting edges represent a corrugated form of alternate transverse projections and recesses adapted to coact with the under knife in cutting the slits at the proper intervals and to stretch the severed strands, and either the upper cutter or the sheet is shifted back and forth between the operations as will be understood.

In the accompanying drawings Figure 1 is a perspective of a sheet, a part of which has been expanded by my invention. Fig. 2 is an elevation of the preferred form of cutters used in manufacturing it. Fig. 3 is a section on line 3-3 of Fig. 2. Fig. 4 is a plan of the sheet showing the first line of slits in dotted lines.

In the drawings A represents the sheet from which the expanded metal is formed. B represents the series of upper or moving cutters and C is the lower knife which may be and preferably is stationary. The lower edges of the cutters B are so shaped as to form alternate transverse projections *b* and recesses or intervening openings *c*, the projecting portions being adapted to coact with the lower knife in forming the slits. They are also adapted to force or carry downward the severed portions of the metal at the same operation to the position indicated by the broken lines *m* at Fig. 2. It will be noticed that at the time the bend is imparted to the severed portion, there can be no contraction in the product from the length of the sheet A, because
the ends of the severed portion or strand are still integral with
337 the sheet and will not permit it. The sheet is then fed for-
ward and the slitting and stretching operation is repeated.
One line of slits across the sheet is formed at each operation, and the upper cutters, or the sheet, may be shifted and the sheet be fed forward between the operations so that the slits are in every case made back of the portions left unsevered at the preceding operation, or, in other words, the slits and unsevered portions alternate in position at successive operations. The bend given to the severed portion or strands as they are usually called, is in a direction at right angles to the plane of the sheet, and as there is no contraction in the length of the metal, it necessarily follows that the expansion is obtained from the stretch, distention or elongation of the several strands."

In conformity with the specification, the applicant claimed

"The herein described method of making open or reticulated metal work, which consists in simultaneously slitting and bending portions of a plate or sheet of metal in such manner as to stretch or elongate the bars connecting the slit portions and body of the sheet or plate,

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and then similarly slitting and bending in places alternate to the first mentioned portions, thus producing the finished expanded sheet metal of the same length as that of the original sheet or plate, substantially as described."

The circuit court sustained the validity of the patent and the charge of infringement, and made the usual decree for a perpetual injunction and an account. From this decree the present appeal is taken and several questions are presented and have been ably argued by counsel, both orally and upon the printed briefs. Of these, however, we think it unnecessary to consider more than one, namely, the validity of the patent in suit. It must be conceded that the case is close, and that reasons for the decision of the circuit court are not lacking; but we have been obliged to come to the conclusion that the so-called invention was not really an invention at all within
338 the meaning of the patent laws. As we regard the application, it was no more than the announcement by Golding of a happy thought, unaccompanied by any sufficient description of the means by which his thought might be realized. Indeed, it does not seem unfair to add, that the applicant himself was in such doubt about the validity of the patent in suit, by which he sought to protect the method of manufacture therein described, that he hastened to take out a patent for a machine by which the desired result could be accomplaished, and obtained by letters No. 581,713, all the advantage over his competitors to which we think he is entitled.

When the patent in suit was applied for, it was certainly well known that a strip of a thin metal blank, partially severed by a slot from the portion adjacent thereto, could be stretched; but, in spite of this fact, the patent undertakes to obtain a monopoly of such stretching, whenever this result is accomplished by a particular method, namely, by acting upon the bars that connect the slit portions and the body of the sheet or plate, so as to stretch them at the time when the slit is made and the slit portion is bent. Whatever the manner by which this simultaneous action is brought about, the claim is broad enough to cover it, and the consequence is, as it seems to us, that the applicant is asking for a patent upon what may have been a valuable isea, but was after all no more than this. His specification and claim may be condensed into a brief announcement to the world, that it would be an improvement in the process of manufacturing expanded metal, to stretch certain portions of the metal at the time when the slit was cut and the mesh was opened. He did not explain how this was to be done, save in a rudimentary and insufficient way, until the made his application for a machine to put his idea into practice; and we repeat, therefore, that in our opinion his patent for a so-called method is obnoxious to the well-known rule which is thus summarized in section 509 of Robinson on
339 Patents:

"Patents are not granted for abstract ideas, principles, modes of operation, functions or results of machines, but underlying every patentable invention is the idea of means. The thing patented is the concrete expression of this idea, the mechanism by which it is reduced to practice (Burr *vs.* Durkee, 1 Wall., 532;

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O'Reilly *vs.* Morse, 15 How. 62). It is this which must be set forth in the claim in distinction from the discovery or conception, idea or mode of operation which it embodies."

Without extending this opinion, we think the principles laid down by the supreme court in Risdom Iron Works *v.* Medart, 158 U. S. 68, and the other cases, both in that court and in the lower courts, which have recognized these principles as valid—many of them are cited on the appellant's brief—require the reversal of the decree appealed from, with instructions to the circuit court to dismiss the bill at the costs of the complainant.

It is therefore so ordered, with further instructions to the clerk of this court that the costs of the appeal are to be paid by the appellees.

340 In the United States Circuit Court of Appeals for the Third Circuit.

No. 4. March Term, 1906.

E. S. BRADFORD, J. C. MILLICHAMP, N. J. SCHMUCKER, JR., and N. J. SCHMUCKER, Appellants,

v.

THE EXPANDED METAL COMPANY and HENRY CHESS, WALTER CHESS, and HARVEY CHESS, Partners as Chess Brothers, Appellees.

Appeal from the Circuit Court of the United States for the Eastern District of Pennsylvania.

This cause came on to be heard on the transcript of record from the Circuit Court of the United States, for the Eastern District of Pennsylvania, and was argued by counsel.

On consideration whereof, it is now here ordered, adjudged and decreed by this Court that the decree of the said Circuit Court in this cause, be, and the same is hereby reversed with costs.

And it is further ordered that this cause be remanded to the said Circuit Court with directions to dismiss the bill of complaint at the costs of Complainant.

GEO. GRAY,
Circuit Judge.

Philadelphia, September 12, 1906.

(Indorsed:) No. 4, March Term 1906, U. S. Circuit Court of Appeals, Third Circuit. E. S. Bradford, *et al.*, Appellants, *v.* The Expanded Metal Company *et al.*, Appellees. Order reversing decree. Entered and filed September 12, 1906.

341 In the United States Circuit Court of Appeals, Third Circui

EUGENE S. BRADFORD, JOSEPH C. MILLICHAMP, NICHOLAS SCHMUCKER, JR., and NICHOLAS J. SCHMUCKER, Respondent Appellants,

v.

THE EXPANDED METAL COMPANY and HENRY CHESS, WALTE CHESS, and HARVEY B. CHESS, Co-partners, Trading as Che Brothers, Complainants-Appellees.

Appeal from the Circuit Court of the United States for the Easter District of Pennsylvania.

342 *The Petition of the Expanded Metal Company and Hen Chess, Walter Chess, and Harvey B. Chess, Co-partner Trading as Chess Brothers, Appellees, for a Rehearing.*

To the Honorable the Judges of the United States Circuit Court Appeals for the Third Circuit:

Your petitioners respectfully represent that on the 10th day September, 1906, an opinion was filed in this Court reversing the d cree of the Circuit Court for the Eastern District of Pennsylvani and directing that Court to enter a decree dismissing the bill of com plaint.

That it appears by said opinion that this Court decides that th letters patent of John F. Golding, No. 527,242, dated October 9, 189 are null and void, which decision these petitioners believe to hav been made from a misapprehension by the Court of the nature of th invention described and claimed in the said letters patent, which mi apprehension, as your petitioners believe and respectfully aver, ap pears from said decision.

That the Court has misunderstood the complainant's patent an its sufficiency to describe the invention, this misunderstanding ari ing, as your petitioners believe, from the misunderstanding of th nature of the inventive act which the patent purports to describe.

That the Court has misunderstood the relation of the Goldin machine patent 581,713 to the art, and its sufficiency to protect th invention.

And your petitioners will ever pray.

THE EXPANDED METAL COMPANY AND
HENRY CHESS, WALTER CHESS, AND
HARVEY B. CHESS,
Trading as Chess Brothers.

By Their Counsel, ERNEST HOWARD HUNTER.

343 A hearing of this case is asked upon a sincere belief that th invention of the patentee, Golding, has been misunderstoo by the Court.

As the opinion of the Court is understood it appears to be base on what we believe to be a misconception of the inventive act upo which patentability is predicated.

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The effect of this decision, if allowed to stand, will be most serious in its consequences to a very important industry, in which a large amount of capital has been invested on the faith of the validity of the grant of the patent by the Government, and we feel convinced that the Court will not refuse to give the patent further consideration, if there is any probability, or even a possibility, that a mistake has been made.

The expanded metal industry has in recent years assumed very great importance both in this country and abroad. Its development has been due, as we believe, entirely to the improvement described in the patent involved in this case, and the overthrow of that patent will necessarily lead to most serious consequences to those who have invested their capital and given their energies to the creation and up-building of this industry.

We appreciate fully that the importance of the industry and the consequences that may result from the decision cannot in any way affect the validity of the patent, and we do not urge these matters as reasons why the patent should be upheld; but we do appreciate that these are matters which should induce this Court, as a Court of last resort, to take extra precautions to prevent mistake, and to examine the case most carefully to determine whether a mistake may have been made.

The importance of the industry is shown by the testimony in this case. It is being carried on abroad under corresponding patents in Great Britain, France, Germany, Belgium, Austria, Spain, Russia
and Canada. The African, Indian, South American and
344 Australian markets are supplied by the British Company.
In this country the industry is carried on in four factories—
at Pittsburg, Chicago, Boston and San Francisco.

This great industry has been built up on the faith of this patent, and it should not be destroyed unless this Court is compelled by the law to hold the patent bad.

We believe that the Court has misunderstood the scope and meaning of the claim, and ask a rehearing that this mistake may be corrected, or at least that the Court may give the subject further consideration to determine whether a misunderstanding has occurred.

The Court has stated that the case is close, and that reasons for upholding the patent are not lacking. In a case that is admittedly close there is serious possibility of error; and, firmly believing that there is error in the decision of the Court, we ask for a further consideration of the question before that decree becomes a finality.

We believe that the Court has misunderstood:

First. The real meaning of the claim of the patent and the nature of the improvement which it was intended to define, and,

Second. Certain facts, which, while not in themselves conclusive of any material question, appear to have led the Court into the first error and to be relied upon as substantial arguments in support of it.

More particularly as to the first point, we believe that the Court has erred in construing the claim of the patent as for a single act or step, unpatentable in itself, whereas it is in fact for two acts or steps successively performed in a certain relation to one another and to the

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material acted upon, whereby a new result is produced by the co-action or combination of such steps. And as to the second point, we believe that the Court has misunderstood the description of the
345 improvement in the patent in the light of the known prior art and its sufficiency for the purpose of disclosing the invention, and has also misunderstood the relation of the machine patent to the art and its sufficiency to protect the invention made by Mr. Golding.

The Court has erred in construing the claim of the patent as for a single act or step, whereas it is in fact for two acts or steps successively performed in relation to one another and to the material acted upon, so that a new result is produced by the co-action or combination of such steps.

This suit was brought to restrain the infringement of Golding's patent 527,242, dated October 9, 1894 (App. Rec. p. 94-95), and for damages for such infringement.

The patent relates to an improvement in the "*art* of expanding sheet metal." By that is meant, the practice or method of producing that thing known as "expanded metal" or expanded sheet metal. The word "art," as it is here used, is defined (Cent. Dic. Tit. "Art," 4.) as, "A system of rules and traditional methods for facilitating the performance of "certain actions," as *e. g.* the art of building and the like.

The improvement described in the patent purports, therefore, to be something new in the system of rules and traditional, or known, methods for producing expanded metal.

Usually when we speak of an "art" in this sense we speak of something very old, as the art of dyeing, of weaving or of printing, and many arts go back beyond the memory of man and historic record. The particular art, however, to which this patent relates is very new. The evidence in this case shows that, as a tangible art, it was created by this patentee, Golding, and his associate, Durkee, in 1885, and that the name "expanded metal" was originated at that time. (Appellees' Brief, p. 23). It is true that there had been earlier
346 attempts to expand sheet metal—by Long, in 1862 in England, and by Golding himself in this country in 1884, but such efforts were not practical or successful, and it was not until the discovery by Golding and Durkee of a practical method of making such metal, in the manner described in their patent of 1885 (App. Rec. 120), that the art of making expanded metal had any existence. Though the art was thus recently created it was none the less an "art"; there was created a system of rules and methods by which this thing known as expanded metal could be created and rendered available for the uses of mankind.

The term "expanded metal" originated by Mr. Golding and his associates to designate the material, most happily and accurately described it. It is metal which has been converted into a unitary reticulated or open meshed sheet by expanding a sheet of metal into a greater area than the original blank. Open or reticulated sheets had

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viously existed, such as wire mesh formed of interwined wires or
s, but that was not "expanded metal" because it was not a unitary
et and was not formed by the expansion or enlargement of a
nk; sheet metal had been cut and stamped up in various forms
ee Elkins and Ohl patents, App. Rec. pp. 276, 284), but that was
t "expanded metal," because the original sheet was not enlarged or
panded in area; it remained of the same length and breadth, it
d been changed in superficies only.

The term "expanded metal" refers only to that kind of metal
ich has been expanded in area; *i. e.* in length or breadth, or both,
cutting and opening it into a reticulated form.

And when the patentee, Golding, refers to the "art of making ex-
nded sheet metal," he refers to this art only, and in stating that
has made an improvement in this art, he is stating that he has
made an improvement in the system of rules and known
7 methods for the performance of those actions of cutting and
expanding a sheet by which "expanded metal" could be pro-
ced.

This art, as it existed at the time of Golding's improvement, em-
aced two ways or methods of accomplishing the result; first, the
ethod of preliminary slitting, and pulling the strands thus formed
art, by a subsequent and independent operation, described in
ong's 1862 British patent (Rec. 287), Johnson's British patent
Rec. 292), Golding's 1884 patent (Rec. 98), and Golding's 1885
tent (Rec. 102), and second, the method of simultaneously cut-
ng and bending the strands by opening successive lines of meshes
lines parallel to one another but oblique to the original edge of the
eet, described in the Golding & Durkee 1885 patent 320,242 (Rec.
20), and explained at length in Appellees Brief pp. 10-18).

This constitutes the whole art as it existed in 1885, and as it re-
ained without advance or improvement until the invention of the
atent in suit in 1894, and the question presented to the Court is
hether the improvement which the patent describes is such an ad-
ance or step in the art as constitutes an invention susceptible of pro-
ection under the patent laws.

Realizing the exceptional importance of this improvement from a
ractical point of view and that it has worked a revolution in the art
y the introduction of radically new rules and methods of procedure,
e felt confident when we presented this case that the Court would
ecognize this as an invention of exceptional merit, and the fact that
he Court has, in the opinion just filed, reached a different conclusion, makes us feel that we have failed to present the matter as fully
nd clearly as it should have been presented.

In explaining the invention the Court states:

"The subject of the invention, as declared in the specifica-
348 " tion, is 'a new and useful improvement in the art of ex-
" panding sheet metal'; and the precise improvement which
" the applicant asserted that he had made was the simultaneous cut-
" ting and opening or expanding, the metal at the cuts by stretching
" the severed portions. In other words, he applied for a patent upon
" a method of manufacture, and as will appear from the specifica-

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" tion, which we are about to quote, *he distinctly limited the novelty* " *of his method to the stretching of the severed portions at the time* " *when -he metal was cut and the slits were opened.*"

It would thus appear that what the Court has understood to be the precise improvement claimed by the patentee is the "simultaneous cutting and expanding the metal at the cuts *by stretching the severed portions.*"

The Court has very properly refused to sustain a patent for this act of simultaneously cutting, bending and stretching metal strands, and has very properly decided that such an act involves nothing more than an abstract idea, which cannot be made the subject of exclusive appropriation. If this was what the patentee had claimed, we would not question the soundness of the Court's decision. We concede, not only that the simultaneous cutting, bending and stretching of metal strands is a mechanical act that cannot be made the subject of a patent, but also that it is an act which was well known and practised in metal working. It is shown for examplé in the Ohl patent, 475,700 (Rec. 284).

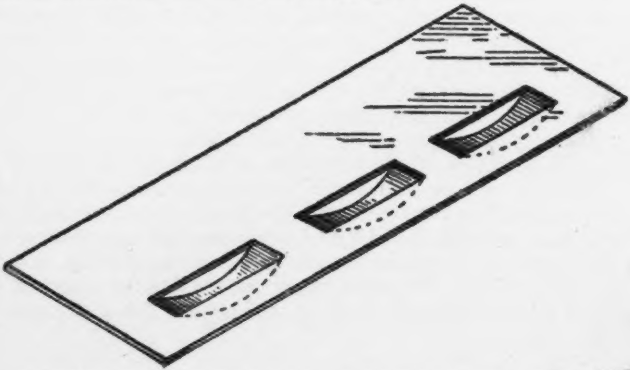
But the patentee does not claim a patent for this act of simultaneously cutting, bending and stretching metal strands. In that there was neither novelty nor patentable process.

The process consists in simultaneously cutting, bending and stretching metal strands, and *then again* simultaneously cutting, bending and stretching other strands, *the two acts being per-*
349 *formed in such relation to one another and to the metal acted upon that they co-act to produce a result, due to their peculiar combination.*

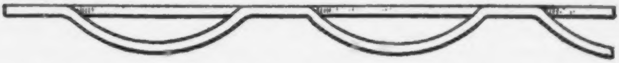
The act of simultaneously cutting, bending and stretching metal strands does not produce expanded metal, nor does the repetition of that act produce such metal. It is only when the two acts are so performed with relation to one another and to the metal acted upon that their separate results coalesce, as it were, and combine together to produce a unitary result.

This act of simultaneously cutting, bending and stretching metal strands in a sheet of metal results in the formation of bent strands extending below the plane of the sheet and leaving openings in the body.

This is illustrated in the following view:

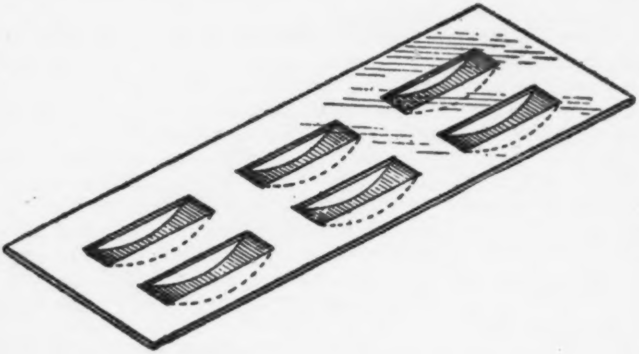


And the result is the same, or substantially so, whether such strands be cut, bent and stretched in the body of the sheet, as in the above view, or at the edge as shown below.

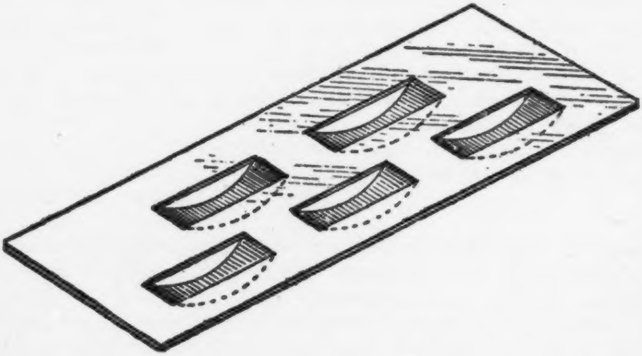


Manifestly this step of simultaneously cutting, bending and stretching strands does not produce expanded metal. It merely
350 results in punching down stretched *loops,* or half diamond, if the loops are angular in form.

Nor will the mere repetition of this act produce expanded metal. We will then have merely a series of such rows of such loops. This is illustrated in the following view:



And it does not matter whether the strands in succeeding rows are cut, bent and stretched in line with one another, as in the above view, or in alternate positions, as in the following view:



351 If the Court will refer to Ohl's patent (Rec. 284), it will be seen that this is exactly what is shown in that patent. It is shown also in the Elkins patent.

It was unfortunate at the time of the argument of this submit to the Court. A sample was obtained after the argument and the suggestion was made that it should be submitted, but as appellants' counsel were unwilling to consent, we did not feel it proper to submit it after the argument. We have, however, prepared samples of this Ohl metal which we submit herewith. They are believed to correspond accurately with description contained in the Ohl patent.

We have here metal which has been made by the performance of this act of simultaneously cutting, bending and stretching strands in a metal sheet. The act has been repeated and the strands have been formed in alternate positions, yet it is clear that expanded metal has not been produced. The sheet still has its original length and breadth; it has not been expanded or enlarged in area, but merely changed in superficies.

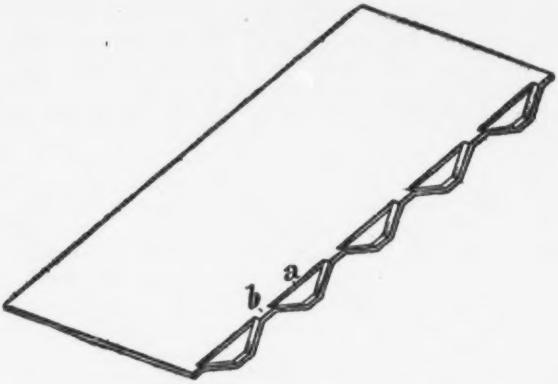
It follows, therefore, that the mere act of simultaneously cutting, bending and stretching metal strands does not produce expanded metal, nor the mere repetition of that act, nor the mere alternation of the positions of the strands in successive rows. We have all of those operations and arrangement in the Ohl lathing.

Why is it then that the performance of these operations does not result in expanding the metal? *It is simply because there is no co-operation between the successive steps.* Each step of cutting, bending and stretching a row of strands, is independent of the others, it does not affect or qualify any of the others, it does not coact with other steps to produce a result due to combined action.

Here we have a series of separate independent operations each complete in itself.

352 To produce expanded metal something more is necessary. The successive steps of cutting, bending and stretching the strands must be performed in such relation to one another and to the metal acted upon that they will co-act, and that the result produced will not be a series of independent results, each due to the performance of a single act, but a different result due wholly to the combined results of successive acts.

The first step of simultaneously cutting, bending and stretching strands, in the production of expanded metal, does not differ in its result from any of the separate steps above referred to. It merely produces stretched loops or half diamonds struck down from the plane of the sheet thus:



The metal is not yet expanded. There is merely formed a row of loops or half diamonds.

Expanded metal is made up of open meshes bounded on all sides by strands. This first step produces but a half-mesh, bounded by strands on one side only. To produce the complete mesh the second step must be performed, but it must be so performed that it will produce the intended result. The mere repetition of the operation,
as in the Ohl patent above referred to, will not produce the
353 result. It is necessary that the second act of cutting, bend-
ing and stretching shall be performed *at the uncut edge of the metal and in a position alternate to the performance* of the first act. This is described in the patent in ll. 34-47 (Rec. 95):

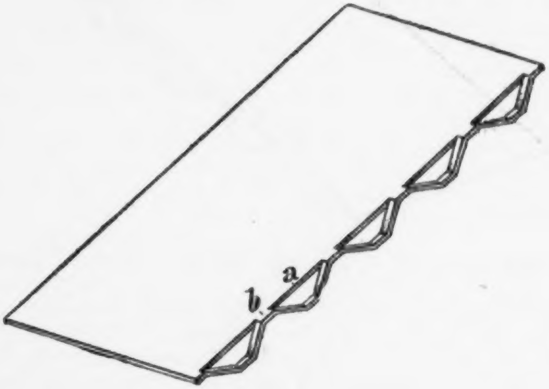
"In the practice of my invention I prefer to make a series of slits " in a straight line *across the edge of the sheet,* and at the time of " cutting the slits and as a continuation of that operation to depress " or stretch the severed metal, *i. e., those portions of the sheet lying* " *outside of the cuts,* in a direction at right angles to the sheet, with- " out any contraction from the length of the original sheet. *This* " *operation is then repeated after the sheet has been fed forward,* " the slits being made opposite the portions unsevered at the previous " operation, and so on until the entire sheet is expanded."

And in lines 90-98.

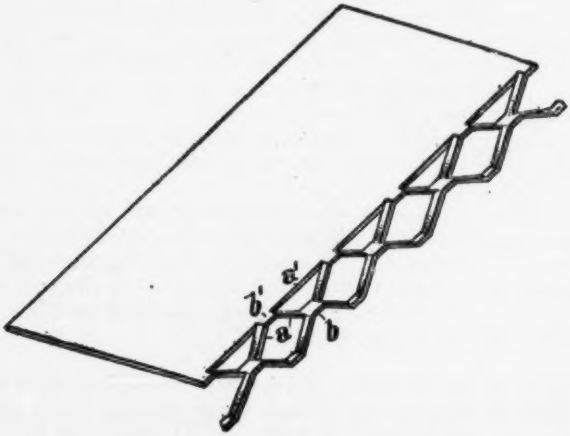
"One line of slits across the sheet is formed at each operation, " and the upper cutters, or the sheet may be shifted and the sheet be " fed forward between the operations so that the slits are in every " *case made back of the portions left unsevered at the preceding op-* " *eration,* or in other words the slits and unsevered portions alternate " in position at successive operations."

To make expanded metal, the first step is performed at the edge of the sheet to depress and stretch those portions lynig outside of the cuts, *i. e.,* the strands, and the second step must be similarly performed *at the new edge* thus created to *similarly* depress and stretch those portions of metal lying outside of the new cut of line of cuts, *i. e.* the second strands, and it must be performed at a point alternate to the first step, so that the slits in every case will be made back of the portions left unsevered at the previous operation.

354 We have seen that the first step merely cut, bent and stretched the strands, forming the loop or half mesh, or row of loops or half meshes, at the edge of the sheet, thus:



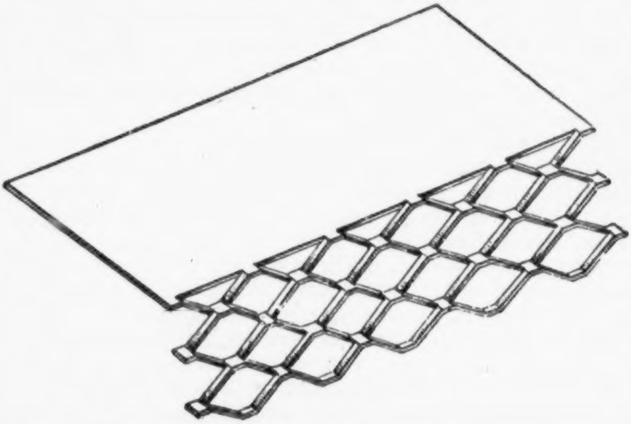
The second step is performed at the new edge *a* and the metal is similarly cut, bent and stretched, but the slits are made at the points *b* *"back of the portions left unsevered at the preceding operation," with the result* that, as the new loops or half meshes are thus formed, the metal at the tops (*b*) of the previously formed loops is severed *and pushed down* as shown in the following view:



355 This cutting away and pushing down of the metal at the points *b* resulting from the second operation, thus caused the first loop to be moved away from the body of the sheet

and a new edge a^1 is formed, upon which the next step is performed as before at points alternate to the last. The second operation is exactly similar to the first operation so far as concerns the cutting, bending and stretching, but, by reason of the fact that it is performed at the edge of the metal and back of the portions left unsevered at the preceding operation, it not only cuts away and pushes down the upper portions or angles (*b*) of the first loops or half meshes, but by the creation of a second set of loops or strands furnishes the strands necessary to make the completed mesh. Thus, the metal is "expanded," and the expansion is produced, not by either operation of cutting, bending and stretching the strands alone, but by the co-action of the two in the particular manner described. These two operations, performed in any other relation to one another and to the sheet acted upon would not produce expanded metal.

The third step, performed again in the same relation to the second step, that is *along the edge* and *"back of the portions left unsevered at the preceding operation,"* will push down the points *b'* and expand the metal still further, as shown in the following view:



356 There was certainly nothing like this known in the prior art of making expanded sheet metal, nor anything to suggest it. It is true that it was known that metal could be simultaneously cut, bent and stretched, but it was not known that the repetition of that act at the edge of the metal in places back of the portions left at the previous operations would result in the production of expanded metal. It is necessary to secure the result that the cuts, together with the bending and stretching, shall be made *at the edge of the metal* and that each succeeding cut (together with the bending and stretching) shall be made back of the portions left unsevered at the previous operation. Without this the result cannot be obtained.

This is the discovery that Golding made and that he describes in his patent. It constitutes a new method of expanding metal differing materially from the methods previously known and practiced. It consists in the performance of certain operations successively in a certain relation to each previous operation and to the material, by which the successive steps, when so performed, co-act or combine together in the production of a new result.

Golding did not invent or first suggest the separate operations. The operation of simultaneously cutting and bending metal so as to stretch the strand was old. What Golding discovered or invented was *the act* or repeating that old operation *in such a way that the two operations would combine to produce a new result by reason of their combination.*

Perhaps in our argument we emphasized too much the feature of stretching, from which the Court appears to have concluded that in this alone resided the inventive act. Simultaneous cutting and bending was old in the art of expanding metal; but in that method the strands were not stretched; in the new method the strands are simultaneously cut, bent and stretched. The new or added *characteristic* was the stretching, but the *inventive act* did not lie in
357 the mere thought or suggestion that the strands should be stretched at the same time they were cut and bent, as the Court appears to suppose. That idea was old in the cognate art of making metallic lathing by punching up loops in sheets. It has been known for years. There was nothing new, therefore, in the idea of stretching strands *per se.*

But the simultaneous stretching of strands with the cutting and bending, as it was applied and known did not result in expanding sheet metal; and the inventive act consisted in the discovery of the manner in which the metal might be simultaneously stretched, cut and bent. An invention does not exist in an abstract thought, but in the practical application of that thought to the accomplishment of a new or better result. The mere thought that the metal might be stretched while it was cut and bent amounted to nothing. It could not be applied to the known method of making expanded metal, because the methods of cutting and bending *prevented stretching.* The metal was so cut that the resistance to bending was removed and consequently the metal strands could not be stretched. To make a practical application of the thought and to enable the characteristic of the stretching to be added or introduced, it was necessary to discover a new manner of performing the operations of cutting and bending—a new relation or sequence of the acts, which differed not only from the relation or sequence of the acts previously performed in expanding metal without stretching, but also from the relation or sequence of the acts performed in making lathing with stretching. The patentee did not therefore limit "the novelty of " his method to the stretching of the severed portions at the time " when the metal was cut and the slits were opened."

It is true that such was the novel *characteristic* of the metal produced, but what he discovered was the novel manner in which the metal could be simultaneously cut, bent and stretched to in-
358 troduce that novel characteristic. The inventive act consisted not in the idea of stretching but in the new method of acting on the metal by which stretching was practically applied.

And this discovery was certainly not obvious. The making of expanded metal as a commercial art had existed since 1885; the fact that a metal strand could be simultaneously cut, bent and stretched was known certainly as early as 1889 (Elkins' patent, Rec. 276), and must have been known much earlier. The production of expanded metal under known methods was unsatisfactory. The companies engaged in the business were not succeeding, yet it did not occur to any one that the difficulties could be overcome by applying the known principle of simultaneously cutting, bending and stretching strands to the making of expanded metal.

This is shown, particularly by the statement in the Golding and Durkee patent of 1885 (Rec. 121):

" It is evident that the meshes could not be cut and simultaneously " formed if the cuts were made in a single direct lines across the " metal, for the reason that as the meshes are made the article which " they form is contracted to a length less than the original length of " the metal from which it is cut."

It certainly must have been known to Golding and Durkee, at that time, or to anyone familiar with the art of metal working, that metal could be simultaneously cut, bent and stretched; any metal punching or stamping machine did that. But it was not known that that operation could be applied to the making of expanded metal, because its application was not obvious and did not lie within the skill of the calling. And it did not lie within the skill of the calling because that operation was available for the production of expanded metal only when it was applied in a certain manner. It was this manner of applying that known operation that Golding discovered and in which his invention exists.

359 To make expanded metal by this operation it was necessary not only to simultaneously cut, bend and stretch the strand but also to *expand the metal sheet.* The world knew how to do the first; Golding told it how to do both.

Perhaps the error of the Court has arisen from a too literal interpretation of the claim of the patent.

A patentee is, of course, bound by his claim, which is intended to particularly point out those features wherein the invention consists and to distinguish them from that which is old.

The claim, which is thus made by the patentee is to be the measure of the extent of his monopoly, but it is to be construed liberally and not too strictly. If there is any doubt as to its meaning, recourse must be had to the specification to interpret it.

We must remember that the underlying theory of our patent laws—the only justification for the grant of the patent right—is that, in consideration of an inventor making his invention known, he is to have governmental protection in the exclusive right to his invention for a limited time. The Federal Courts constitute that portion of the Government to which is delegated the duty of carrying out this theory, and it is unjust to the inventor, who has complied with his part of the contract by making his invention known, if the Courts, as the representative of the Government designated for this purpose, fail to fulfil their part of the contract. It is the duty of the

Court therefore in interpreting the claim of any patent, to so interpret it as to give to the patentee the full protection to which he is entitled.

The claims of a patent are not to be construed against the patentee, on the theory that because he selected those words to express the limitations of his invention he must be strictly bound to them. Such a rule of interpretation cannot be justly applied to patents granted under our system, because the terms of the claims are not the mere expression of the patentee's ideas of the scope and limits of his 360 invention. Under our system of regulating the grant of patents, we have established an elaborate examining board of experts to pass upon the language of the claims and description and required by law to allow those only that meet with their approval.

It is true that ordinarily the wording of a claim is chosen by the patentee or his attorney and is merely approved by the examining expert; but this patent is in this respect exceptional in that the *particular wording of the claim was not that chosen by the patentee to describe his invention, but that selected by the Government.*

A reference to the proceedings in the Patent Office leading up to the grant of the patent (Rec. 303-314) discloses that originally the patentee claimed broadly the improvement in the art of making expanded metal "consisting in simultaneously slitting the sheet and " stretching the severed portions."

This was clearly a claim to the operation of "the simultaneous " cutting and opening or expanding, the metal at the cuts by stretch- " ing the severed portions."

The opening or expanding was not specifically mentioned, but necessarily resulted from the cutting and stretching of the severed portions. This claim was very properly rejected on the Ohl patent. It was merely a claim to the principle or idea of applying to the art of expanding sheet metal the known operation of "simultaneous cut- " ting and expanding metal at the cuts to stretch the severed por- " tions."

It did not contain those statements as to the repetition of that operation in a certain relation to previous operations and to the metal acted upon, by which alone the metal could be expanded and in which the invention existed.

Before this rejection, however, the patentee submitted 361 a second claim, in which he sought to introduce these features that were lacking in the original first claim. This claim was as follows (Rec. 307):

" The herein described method of making open or reticulated " metal work, which consists in simultaneously slitting and stretch- " ing portions of a plate or sheet of metal away from the plane " of the sheet, and then simultaneously slitting and stretching away " from the plane of the sheet subsequent portions of the sheet in " places alternate to the first mentioned portions, and *by each suc- " cessive slitting and stretching operation forcing the metal already " operated upon further away from the original plane of the sheet,* " substantially as set forth."

The Examiner appreciating the novelty and patentability of the invention the patentee was seeking to cover by this second claim, but not approving of its form, suggested a new claim as a substitute, which the patentee accepted (Rec. p. 308-309).

[NOTE.—The copy of the application file as printed in the Transcript on pp. 308, 309 is perhaps confusing. The claim suggested by the Examiner which appears at the bottom of p. 308 was enclosed in the Examiner's action of July 2, 1894, which appears on p. 309. This claim was adopted by the applicant by the amendment of July 5, 1894 (p. 309), which substituted this suggested claim for applicant's second claim.]

It thus appears that the wording of the claim in the patent was that chosen, not by the patentee, but by the Examiner—the Government's representative—for the purpose of defining the patentee's invention, and expressly for the purpose of distinguishing it from the prior patent of Ohl which disclosed the principle of simultaneously cutting and bending sheet metal so as to stretch the severed strands. It would seem, therefore, that this claim is exceptionally 362 entitled to a liberal interpretation for the purpose of carrying out the intent of the patentee and the Government's agent in defining the invention and the contract created by the patent. If there is anything unhappy in the language selected for the purpose, any difficulty in the way of construction, those defects are not the fault of the patentee but are due primarily to the act of the Government's agent.

We have pointed out that the production of expanded metal by simultaneously cutting and bending the metal so as to stretch the severed strands does not result merely from the performance of that operation, or the repetition of that operation, or in the alternation of that operation, but results only when the successive operations are performed at the edges of the metal and back of the portions left unsevered at the previous operation, so that the successive operations may co-act to press down the angles and thus expand the metal, and it may be said that these steps are not in so many words stated in the claim. The claim which the Examiner suggested and which the patentee accepted is as follows:

"The herein described method of making open or reticulated "metal work, which consists in simultaneously slitting and bending "portions of a plate or sheet of metal in such manner as to stretch "or elongate the bars connecting the slit portions and body of the "sheet or plate, and then similarly slitting and bending in places "alternate to the first mentioned portions, thus producing the "finished expanded sheet metal of the same length as that of the "original sheet or plate, substantially as described."

It is true that this claim does not in so many words say that these successive steps are to be performed at the edge of the metal and back of the portions left unsevered at the previous opera- 363 tion, but it does contain these limitations in effect, for it says that these operations are to be performed "substantially as described," and that their performance substantially as described result- in "producing the finished expanded sheet metal."

These operations are clearly stated in the specification. In lines 35-36 it is said that the first strands are to be formed *"across the edge of the sheet."* The sheet is to be then fed forward and *this operation* is to be repeated (ll. 42-44) and the second strands are to be formed "back of the portions left unsevered at the preceding operation" (ll. 90-96). The second operation is to be performed similarly to the first and must inevitably be performed across the edge of the sheet as is shown in the drawings. The specification does not, in so many words, state that this second operation results, as it necessarily must, in the forcing or pushing down of the top or angle of the previously formed half mesh, thereby expanding the metal, but that is shown in Fig. 1 of the drawings and it was clearly described in the claim which the patentee proposed (Rec. p. 307). In this claim the patentee described this result as follows:

" And by each successive operation forcing the metal already oper-
" ated upon further away from the original plane of the sheet, sub-
" stantially as set forth."

It is the opinion of counsel that this second claim expressed the patentee's invention better than the claim chosen by the Examiner, but the fact is that they were both intended to mean the same thing. The Examiner, who, as the Government's agent, has the power to decide, preferred his selection of words, and the applicant accepted his suggestion, but we must recognize the fact that those words, whether well chosen or not, were intended both by patentee and the Government to express the patentee's invention, and to distinguish it from the mere act of simultaneously cutting and bending
364 metal so as to stretch the severed strands, disclosed in the Ohl and Elkins patents.

This must be obvious from the fact that the Ohl patent was before the Examiner, had been cited by him, and that he suggested the claim which now appears in the patent for the express purpose of distinguishing the patentee's invention from what is disclosed in that patent.

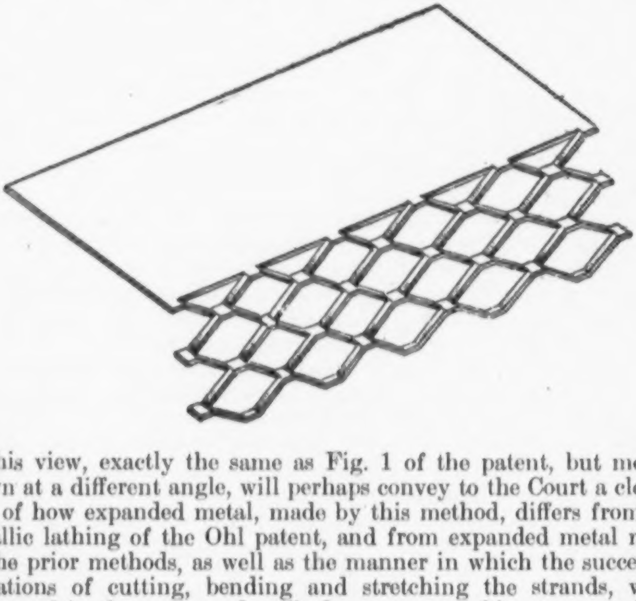
If any claim of doubtful meaning is to be interpreted by reference to the specification and drawing, especially must this be so when the wording of the claim is that chosen by the Government's agent. Interpreted without reference to the specification or drawing, and disregarding the references to them which the claim contains, the claim can be read directly upon the Ohl patent, but the Examiner suggested the claim for the very purpose of distinguishing from that patent, and we are forced to look to the specification and drawings to explain any difficulty there may be in understanding the meaning and the claim expressly directs us to do so.

Welsbach Light Co. *v.* Cremo Incandescent Light Co., 145 Fed. Rep. 521.

There can be no doubt as to the improvement in the art that the patentee made, and the specification and drawing certainly disclose it.

If anything is lacking in the claim, it is a specific statement that the operations of cutting, bending and stretching are to be performed successively at the edge of the metal and back of the portions unsevered by the previous cuts, but these are clearly described in the specification and are shown in the drawings, and recourse must be had to them to interpret the claim.

It has occurred to us that perhaps Fig. 1 of the drawing of the patent has not been understood. It is a perspective view and should be understood by one skilled in interpreting mechanical
365 drawings, but perhaps the draughtsman, while accurate has not been happy in his illustration, and the following view at a different angle may make the matter more intelligible.



This view, exactly the same as Fig. 1 of the patent, but merely shown at a different angle, will perhaps convey to the Court a clearer idea of how expanded metal, made by this method, differs from the metallic lathing of the Ohl patent, and from expanded metal made by the prior methods, as well as the manner in which the successive operations of cutting, bending and stretching the strands, when performed in the manner described, coact or combine to expand the metal.

It seems to us, from the opinion filed in this case, that the Court has interpreted the claim of the patent, not for that method or process which we have described and which it was the intention of the Examiner to protect, when he suggested the claim, but substantially for that which the patentee asked under his original first claim, and which the Examiner refused to protect.

That claim was as follows (Rec. 306):

> "The improvement in the art of manufacturing expanded
> 366 "metal, consisting in simultaneously slitting the sheet and "stretching the severed portions."

As worded this claim was merely the suggestion of the idea that the act of simultaneously cutting and stretching the severed portions of sheet metal might be applied to the art of making expanded metal.

This act was not new in itself. The novelty, if any, expressed in this claim consisted merely in the idea or suggestion that the act might be applied to the making of expanded metal. In that there was no invention, and this is exactly what the Court decides in this case.

The Court says that—

"The precise improvement which the applicant" [patentee] "as-
" serted that he had made was the simultaneous cutting and open-
" ing, or expanding the metal at the cuts by stretching the severed
" portions" * * * "As we regard the application, it was no more
" than the announcement by Golding of a happy thought, unac-
" companied by any sufficient description of the means by which
" his thought might be realized."

As we understand this, the Court has taken Golding's improvement to be merely the suggestion or thought that the idea of simultaneously cutting, bending and stretching metal strands might be applied to the making of expanded metal, that his improvement did not consist in any particular manner of doing this, but merely in the idea.

"Whatever the manner by which this simultaneous action is
" brought about, the claim is broad enough to cover it, and the con-
" sequence is, as it seems to us, that the applicant is asking for a
" patent upon what may have been a valuable idea, but was after
" all no more than this. *His specification and claim may be con-*
" densed into a brief announcement to the world, that it
367 *" would be an improvement in the process of manufacturing*
" expanded metal, to stretch certain portions of the metal
" when the slit was cut and the mesh was opened."

Now this is exactly what was expressed by Golding's original first claim—the mere idea or suggestion that in the making of expanded metal the strands might be simultaneously cut and stretched. It is this that the Government very properly refused to give him.

The invention consisted not in the idea that the simultaneous cutting and bending of strands so as to stretch the severed portions might be applied to the art of making expanded metal, but in the particular manner or method by which that idea might be applied.

It was the discovery of this particular manner or method of applying that idea,—the successive performance of the simple operations in such relation to one another and to the material acted upon that expansion of the metal would result,—that constituted the invention.

The Government's experts recognized this distinction, and while refusing to grant a patent for the abstract idea, granted it for the particular manner or method of applying that idea for the purpose intended.

But the Court, in construing this patent has apparently failed to see this distinction, and has construed the claim to be drawn to the abstract idea, and so understanding it, has declared it invalid.

In other words, the Court has considered the patent as if the claim it now contained was the original first claim which the Government refused to allow.

There are two other particulars in which we consider the opinion of the Court to be erroneous. One of these we believe to follow from the misapprehension of the invention, the other from a mistake of facts. While neither of these is, perhaps, urged as a basis
368 for the decision, they are advanced as arguments in support, or explanation of it.

It is said that the patent is insufficient in its disclosures. The Court says:

"As we regard the application, it was no more than the announcement by Golding of a happy thought, unaccompanied by any sufficient *description of the means by which his thought might be realized.*" * * * "He did not explain how this was to be done save in a rudimentary and insufficient way, until he made his application for a machine to put his idea into practice."

Misunderstanding the invention, the Court has, as it seems to us, naturally fallen into the error of supposing that the patent is insufficient in its explanation of the invention as the Court understands it.

If the real invention existed in the creation of an organized arrangement of instrumentalities to accomplish the object desired, the patent is obviously insufficient. It does not pretend to be a patent for a machine and does not attempt to describe such machine.

The patentee's invention consisted in a combination of certain operations in a certain relation to one another and to the material acted upon, by which a new result might be accomplished. The instrumentalities, which might be employed to carry out that invention commercially, were no part of the invention. What the patentee gave to the world was a new method of manipulating or cutting, bending and stretching sheet metal, to produce the thing known as expanded metal. That new method did not depend upon any particular instruments, it could be carried out by any one by such instruments as might be found best adapted to the purpose. A dozen different machines might be created for carrying out the process; in fact several different machines have been created. Old machines might be reorganized and made to do the work.

369 Given the information as to the new method of treating, or acting upon the metal, the problem of creating a machine capable of doing it was a simple one, which could be solved by any skilled machinist. The invention consisted in the discovery of the *method* not in any particular means for practising it. Every true method or art is one which must be independent of particular means. Instruments must be used to apply it to practice, but the invention must reside in the method and not in the instruments.

"While an art cannot be practiced except by means of physical agents through which the force is brought in contact with or directed toward its object, the existence of the art is not dependent on any of the special means employed. It is a legal, practical invention in itself. Its essence remains unchanged, whatever variation takes place in its instruments, as long as the acts of which it is composed are properly performed."

Robinson, Vol. 1, 250, Sec. 167.

The patent laws require that a patentee shall explain his invention in a manner sufficiently clear to enable those skilled in the art to understand it. If the invention is a machine, then the machine must be described sufficiently to enable those skilled in the art to build and operate the machine; if the invention is a process, consisting, as a process must, merely in the performance of certain operations upon an article or substance, independently of the particular instruments employed, then the patentee must describe the performance of those operations sufficiently to enable those skilled in the art to practice them, leaving to them the choice of the instruments used for the purpose.

If then, Golding's invention existed in a method of treating metal in a certain way; in the performance of certain operations upon it, it is sufficient if he described those operations and the manner in which
they were to be performed. It was unnecessary (and in fact
370 would have been improper) for him to have described an
organized machine for the purpose.

The Court finds the patent insufficient in its disclosure, because it does not describe such a machine. Such a machine was no part of Golding's invention. *The process* was sufficiently disclosed to enable those skilled in the art to understand it, as a process.

This is all that is required of a patentee. His description and illustrations are prepared for the skilled expert in the art, not for the unskilled. The Government employs trained experts to pass upon this question, men charged with the duty of refusing to grant patents which are insufficiently explained. Golding's explanation was sufficient for the Government's expert, and it has proved sufficient to others skilled in the art—amply sufficient to enable infringers to understand and practice the invention by instruments or machines of their own devising.

We submit that under these circumstances the Court was not justified in suggesting that Golding's patent is insufficient in its disclosure of his process of making expanded metal.

It is true that the Federal judiciary are charged with the duty of *deciding* this question, but the Federal judges are not experts in the mechanical arts. An invention is not insufficiently described because the description is not sufficient for them. The sufficiency of the description has been approved by the Government's expert before the patent was granted, and there should be some evidence before the Court to justify a contrary finding. It is not for the Court to decide as to the sufficiency of the description but as to the sufficiency of the evidence of sufficiency. The law requires only that the patentee shall so describe his invention as to enable those skilled in the art to under-
stand it; the grant of the patent by the Government's expert
371 raises a strong presumption that he has done so, and there
should be competent expert evidence to justify the Court in
finding to contrary.

We feel convinced that the suggestion in the opinion that the invention is sufficiently described has arisen wholly from the misunderstanding of the invention. If the patentee had invented a machine, his disclosure was insufficient; but, as a method of performing certain steps in a certain way to produce expanded metal, we submit that the specification and drawings are ample.

If the Court considers this question material, we ask for a rehearing for the express purpose of submitting evidence on this point. In another case, involving the same patent, we have (in view of this decision) called expert witnesses on this point. We are willing to submit the questions to any unprejudiced expert and to abide by his decision as to whether the patent is sufficient to enable those skilled in the art to understand and perform the operations described in the patent for producing expanded metal.

But we think the sufficiency of this patent to describe Golding's process is very clearly shown by the evidence; there can be no doubt that it was understood by all of the witnesses who have testified. It was submitted by defendants' expert that the defendants' machine performed the process, an admission which could not have been very well made if the process was not understood. In fact the question of sufficiency was not even raised by appellants' counsel in the argument or brief.

A Patent for a Machine is Wholly Inadequate to Protect the Invention Made by Golding.

The Court says:

"Indeed it does not seem unfair to add, that the applicant himself
" was in such doubt about the validity of the patent in suit, by which
" he sought to protect the method of manufacture therein described,
" that he hastened to take out a patent for a machine by which
372 " the desired result could be accomplished, and obtained by
" letters No. 581,713, all the advantage over his competitors
" to which we think he is entitled."

We submit that there is nothing to suggest any doubt in the mind of the patentee as to the validity of his method patent. He did not hasten to take out a patent for a machine. The machine patent was applied for on May 20, 1896, more than two years after the filing of the application for the process patent, and one year and seven months after the process patent had issued. This does not indicate either haste on the part of the patentee or the existence of doubt as to the validity of his patent.

The invention of the machine was not contemporaneous with the invention of the process. They were entirely separate and distinctive acts, separated by a long interval of time.

When Mr. Golding had conceived the new method of expanding sheet metal by subjecting it to certain operations in certain relations and in a particular manner, he performed those operations by hand, with the aid of a chisel, and thus demonstrated the practicability of his ideas. This was the completion of an inventive act.

There was no serious problem involved in making a machine that would be capable of performing the process to the extent that would be necessary to produce expanded metal commercially.

Given the method to be carried out, we submit that any skilled machine builder could design a machine capable of doing it. With Mr. Golding's process patent before him, such person would not find the problem difficult of solution. Not one, but a dozen different machines, might be made to accomplish the work. Golding's machine, described in his patent 581,713, issued two years later, was merely that particular arrangement of machinery which he thought well adapted for performing the process in a commercial manner. It was not the only machine adapted for the purpose. Different 373 machines had been devised. The defendant's machine in this case is wholly different from Golding's machine, and we know of other different machines that have been used.

It must be evident therefore that no patent on a machine could give Golding any protection on his improvement in the method of making expanded metal. These different machines all perform the method, yet they are different in construction and do not infringe upon one another. It is this fact, that the method can be practiced by different and non-conflicting machines, that indicates most persuasively that the invention resides in the method and not in the mechanical devices for practising it.

No patent on a machine could protect this invention, and it was not intended or expected that Golding's machine patent 581,713, would do so.

If Golding's invention or discovery could not be protected by a patent for a machine, does it follow that he must be without any protection? And for what reason? He made a great and valuable discovery in a particular art which worked a revolution in the practice of a certain industry and has been of great public benefit. In compliance with the law, he made that discovery known to the public, upon the promise that he should control its use for seventeen years. They should be very strong reasons which compel this court to refuse to carry out the Government's promise and the soundness of those reasons should be free from doubt.

The Court has understood this invention to exist simply in the thought that the strands might be stretched while they were being cut and opened to make expanded metal, and it is not surprising, that, with this understanding, the claim appeared obnoxious to the rule stated in Burr *v.* Durkee and O'Reilly *v.* Morse, but the invention does not exist in that.

Golding's invention consisted in the descovery of *a new way* 374 in which the metal might be simultaneuosly cut and bent to produce expanded metal, by which the characteristic of stretching might be introduced and the length of the sheet preserved. The new characteristic was the stretching, but the inventive act involved was the discovery of the particular way in which that characteristic might be introduced. That new way consisted in the performance of acts, old in themselves, but combined in a new way to produce the result by their coaction.

When the inventive act is thus understood, we submit that the rule in the case referred to is without application.

In conclusion, we submit that the Court has misunderstood Golding's improvement described in his patent; that when the patent is properly construed, it describes an invention in the art of expanding sheet metal and patentable as such; that the patent describes this invention sufficiently to enable those skilled in the art to practice it, and that there is no evidence to the contrary, and finally that the improvement could not be protected by a patent on a machine and that the machine patent 581,713, refers to an entirely independent and distinct inventive act.

That these questions may be given that consideration which we believe their importance justifies we respectfully ask a re-hearing of the case.

ERNEST HOWARD HUNTER,
Of Counsel.

Philadelphia, October 1, 1906.

I, Ernest Howard Hunter, certify that I am counsel for the complainants-appellants, in the above named cause, and that in my opinion the above petition for a re-hearing is well founded, both in law and in fact and is deserving of judicial consideration, and that the same is not interposed for purposes of delay.

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375 In the United States Circuit Court of Appeals for the Third Circuit.

E. S. Bradford, J. Millicamp, N. J. Schmucker, Jr., and N. J. Schmucker, Appellants,
v.
The Expanded Metal Company and Henry Chess, Walter Chess, and Harvey B. Chess, Co-partners as Chess Brothers.

Before Dallas, and Gray, Circuit Judges, and McPherson, District Judge

Dallas, *Circuit Judge:*

The Expanded Metal Company and Chess Brothers, the company's exclusive licensees in the State of Pennsylvania, were the complainants below and charged the appellants with infringing letters patent No. 527,232, issued in October, 1894, for an invention made by John F. Golding and assigned to the Metal Company before the letters were actually issued. The subject of the invention, as declared in the specification, is "a new and useful improvement in the art of expanding sheet metal;" and the precise improvement which the applicant asserted that he had made was the simultaneous cutting and opening, or expanding, the metal at the cuts by stretching the severed portions. In other words, he applied for a patent upon a method of manufacture, and, as will appear from the specification, which we are about to quote, he distinctly limited the novelty of his method to the stretching of the severed portion at the time when the metal was cut and the slits were opened. The specification refers to the prior art, and to the applicant's proposed improvement, in the following language:

376 "In the manufacture of what is now generally known as expanded sheet metal, it has been customary to first cut the slits in the sheet metal a short distances apart, and to open the metal at the cuts thus formed by bending the severed portions or strands in a direction at right angles substantially to the plane of the sheet. It has also been made by simultaneously cutting and opening the metal by means of cutters set off, or stepped, relatively so as to make the slashes or cuts in different lines in the manner set forth in patents No. 381,230 or No. 381,231, of April 17, 1888. In both of these methods the product is somewhat shorter and materially wider than the original sheet, but practically no stretching or elongation of the metal forming the strands is caused.

In my present invention I seek to avail myself of the ability of the metal to stretch or distend as well as of its ability to bend under strain or pressure, and the invention consists in the improved method of making expanded metal, viz., by simultaneously cutting and opening or expanding the metal at the cuts by stretching the severed portions.

In the practice of the invention I prefer to make a series of slits in a straight line across the edge of the sheet, and at the time of cutting the slits, and as a continuation of that operation, to depress or stretch the severed metal, *i. e.*, those portions of the sheet lying outside of the cuts, in a direction at right angles to the sheet, without any contraction from the length of the original sheet. This operation is then repeated after the sheet has been fed forward, the slits being made opposite the portions unsevered at the previous operation, and so on until the entire sheet is expanded.

My invention allows the use of a single straight under knife, which of course does not need to be shifted in changing the location of the cuts, and the upper cutters are also arranged in a straight line, but their acting edges represents a corrugated form of alternate transverse projections and recesses adapted to coact with the under knife
377 in cutting the slits at the proper intervals and to stretch the severed strands, and either the upper cutter or the sheet is shifted back and forth between the operations as will be understood.

In the accompanying drawings Fig. 1 is a perspective of a sheet a part of which has been expanded by my invention. Fig. 2 is an elevation of the preferred form of cutters used in manufacturing it. Fig. 3 is a section on line 3-3 of Fig. 2. Fig. 4 is a plan of the sheet showing the first line of slits in dotted lines.

In the drawings A represents the sheet from which the expanded metal is formed. B represents the series of upper or moving cutters and C is the lower knife which may be and preferably is stationary. The lower edges of the cutters B are so shaped as to form alternate transverse projections *b* and recesses or intervening openings *c*, the projecting portions being adapted to coact with the lower knife in forming the slits. They are also adapted to force or carry downward the severed portions of the metal at the same operation to the position indicated by the broken lines *m* at Fig. 2. It will be noticed that at the time the bend is imparted to the severed portion, there can be no contraction in the product from the length of the sheet A, because the ends of the severed portion or strand are still integral with the sheet and will not permit it. The sheet is then fed forward *between the operations so that the slits are in* repeated. One line of slits across the sheet is formed at each operation, and the upper cutters, or the sheet, may be shifted and the sheet be fed forward between the operation so that the slits are in every case made back of the portions left unsevered at the preceding operation, or, in other words, the slits and unsevered portions alternate in position at successive operations. The bend given to the severed portion of strands as they are usually called, is in a direction at right angles to the plane of the sheet, and as there is no contraction in the length of the metal, it necessarily follows that the expansion is obtained from the stretch, distention or elongation of the severed strands. 377¼

In conformity with the specification, the applicant claimed:

"The herein described method of making open or reticulated metal work, which consists in simultaneously slitting and bending portions of a plate or sheet of metal in such manner as to stretch or elongate the bars connecting the slit portions and body of the sheet or plate, and then similarly slitting and bending in places alternate to the first mentioned portions, thus producing the finished expanded sheet metal of the same length as that of the original sheet or plate, substantially as described."

The circuit court sustained the validity of the patent and the charge of infringement, and made the usual decree for a perpetual injunction and an account. From this decree the present appeal is taken, and several questions are presented and have been ably argued by counsel, both orally and upon the printed briefs. Of these, however, we think it unnecessary to consider more than one, namely, the validity of the patent in suit. It must be conceded that the case is close, and that reasons for the decision of the circuit court are not lacking; but we have been obliged to come to the conclusion that the so-called invention was not really an invention at all within the meaning of the patent laws. As we regard the application, it was no more than the announcement by Golding of a happy thought, unaccompanied by any sufficient description of the means by which his thought might be realized. Indeed, it does not seem unfair to add, that the applicant himself was in such doubt about the validity of the patent in suit, by which he sought to protect the method of manufacture therein described, that he hastened to take out a patent for a machine, by which the desired result could be accomplished, and obtained by letters No. 581,713, all the advantage over his competitors to which we think he is entitled. 377½

When the patent in suit was applied for, it was certainly well known that a strip of a thin metal blank, partially severed by a slot from the portion adjacent thereto, could be stretched; but, in spite of this fact, the patent undertakes to obtain a monopoly of such stretching, whenever this result is accomplished by a particular method, namely, by acting upon the bars that connect the slit portions and the body of the sheet or plate, so as to stretch them at the time when the slit is made and the slit portion is bent. Whatever the manner by which this simultaneous action is brought about, the claim is broad enough to cover it, and the consequence is, as it seems to us, that the applicant is asking for a patent upon what may have been a valuable idea, but was after all no more than this. His specification and claim may be condensed into a brief announcement to the world, that it would be an improvement in the process of manufacturing expanded metal, to stretch certain portion of the metal at the time when the slit was cut and the mesh was opened. He did not explain how this was to be done, save in a rudimentary and insufficient way, until he made his application for a machine to put his idea into practice; and we repeat, therefore, that in our opinion his patent for a so-called method is obnoxious to the well-known rule which is thus summarized in section 509 of Robinson on Patents.

"Patents are not granted for abstract ideas, principles, modes of operation, functions or results of machines, but underlying every patentable invention is the idea of means. The thing patented is the concrete expression of this idea, the mechanism by which it is reduced to practice (Burr *v.* Durkee, 1 Wall. 532; O'Reilly *v.* Morse, 15 How. 62). It is this which must be set forth in the claim
378 in distinction from the discovery, or conception, idea or mode of operation which it embodies."

Without extending this opinion, we think the principles laid down by the Supreme Court in Risdon Iron Works *v.* Medart, 150 U. S. 68, and the other cases, both in that court and in the lower courts, which have recognized these principles as valid—many of them are cited on the appellant's brief—require the reversal of the decree appealed from with instructions to the Circuit Court to dismiss the bill at the costs of the complainant.

It is therefore so ordered, with further instructions to the clerk of this court that the costs of the appeal are to be paid by the appellees.

Filed, September 10, 1906.

Petition for re-hearing filed October 9, 1906.

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379 In the United States Circuit Court of Appeals for the Third Circuit.

No. 4. March Term, 1906.

BRADFORD ET AL., Appellants,
v.
EXPANDED METAL COMPANY ET AL., Appellees.

Sur Petition for Rehearing.

Before Dallas and Gray, Circuit Judges, and McPherson, District Judge.

Per Curiam:

And now, October 15th, 1906, The petition for re-hearing is *Denied.*

(Indorsed:) No. 4 March Term 1906. U. S. Circuit Court of Appeals for the Third Circuit. Bradford, *et al.*, Appellants, *v.* Expanded Metal Company, *et al.* Appellees. Order denying re-hearing. Entered and filed October 15th, 1906.

380 In the United States Circuit Court of Appeals for the Third Circuit.

No. 4. March Term, 1906.

EUGENE S. BRADFORD, JOSEPH C. MILLICHAMP, NICHOLAS J. SCHMUCKER, JR., and NICHOLAS J. SCHMUCKER, Appellants,

v.

THE EXPANDED METAL COMPANY and HENRY CHESS, WALTER CHESS, and HARVEY B. CHESS, Co-partners, Trading as Chess Bros.

Appeal from the Circuit Court of the United States for the Eastern District of Pennsylvania.

And now, to wit, this 13th day of November A. D., 1906, it is ordered that Mandate issue to the said Circuit Court of the United States, for the Eastern District of Pennsylvania in accordance with the Opinion and decree of this Court in said cause.

GEO. M. DALLAS,
Circuit Judge.

Entered and filed November 13, 1906.

381 Copy.

UNITED STATES OF AMERICA, *ss:*

The President of the United States of America to the Honorable the Judges of the Circuit Court of the United States for the Eastern District of Pennsylvania, Greeting:

Whereas lately in the Circuit Court of the United States for the Eastern District of Pennsylvania, before you, or some of you, in a cause between Eugene S. Bradford, Joseph C. Millichamp, Nicholas J. Schmucker Jr., Nicholas J. Schmucker, Respondents-Appellants and The Expanded Metal Company and Henry Chess, Walter Chess and Harvey B. Chess, Co-partners, trading as Chess Brothers, Complainants-Appellees, wherein the decree of the said Circuit Court entered in said cause is in the following words viz:—

It is ordered, adjudged and decreed that the Letters Patent No. 527242, granted October 9, 1894, to the Expanded Metal Company as the assignees of John F. Golding is a good and valid patent, and that the said John F. Golding was the original and first inventor of the method of making expanded metal which is described and claimed in the said Patent, and that said Expanded Metal Company,

one of the claimants is the owner of the said Letters Patent and
all rights secured thereby, and that Henry Chess, Walter Chess an
Harvey B. Chess, composing the firm of Chess Brothers are the e
clusive licensees under the said Letters Patent for the States of Ne
York, Pennsylvania, New Jersey, Delaware, West Virginia and Ohi

It is further ordered, adjudged and decreed that the defendan
have infringed upon the said letters Patent and upon the exclusiv
rights of the complainants therein.

And it is further ordered adjudged and decreed that the com
plainants do recover of the defendants, the profits, gains and advan
tages which the said defendants or any of them have received
made, or which have arisen or accrued to them or any of them fro
said infringement, and any and all damages which the complainan
have suffered or sustained by reason of said infringement, sinc
the date of said Letters Patent, and this cause be referred t
—— ——, as a Master of this Court to ascertain, take and report t
the court an account of the gains, profits and advantages which th
defendants or any of them have received or which have arisen o
accrued to them or any of them from said infringement and als
the damages that may have been suffered by the complainants o
account of said infringement, and that in said accounting the com
plainants shall have the right to cause the examination of the de
fendants and each of them, their agents, servants and employees
and also to the production of the books, vouchers and documents o
each of the said defendants, and that said defendants attend fo
such purpose before the master from time to time as said maste
shall direct.

It is further ordered, adjudged and decreed that a perpetual in
junction be issued in this suit against the said defendants accordin
to the prayer of this bill, and that the complainants do recover o
the defendants their costs, charges and disbursements to b
382 taxed as by the inspection of the transcript of the record o
the said Circuit Court, which was brought into the Unite
States Circuit Court of Appeals for the Third Circuit by virtue of a
appeal agreeably to the act of Congress, in such case made and pro
vided, fully and at large appears.

383 And whereas, in the present term of March, in the year o
our Lord one thousand nine hundred and six, the said caus
came on to be heard before the said United States Circuit Court o
Appeals on the said transcript of record, and was argued by counsel

On consideration whereof, it is now here ordered, adjudged and
decreed by this Court that the decree of the said Circuit Court in thi
cause, be, and the same is hereby reversed with costs, and that the
said Respondents, Eugene S. Bradford, Joseph C. Millichamp
Nicholas J. Schmucker Jr. and Nicholas J. Schmucker, recover
against the said complainants, the Expanded Metal Company and
Henry Chess, Walter Chess and Harvey B. Chess Co-partners, trading as Chess Brothers, twenty dollars for these costs herein expended
and have execution therefor.

And it is further ordered that this cause be remanded to the said Circuit Court with directions to dismiss the bill of complaint at the costs of complainants.

PHILADELPHIA, *September* 12, 1906.

384 You, therefore, are hereby commanded that such execution and further proceedings be had in said cause, in conformity with the opinion and decree of this court as according to right and justice, and the laws of the United States, ought to be had, the said appeal notwithstanding.

Witness, the Honorable Melville W. Fuller, Chief Justice of the Supreme Court of the United States, at Philadelphia, the thirteenth day of November, in the year of our Lord one thousand nine hundred and six.

Costs of Appellants:

Attorney	$20.00
	$20.00

WM. H. MERRICK,
Clerk of the U. S. Circuit Court of Appeals, Third Circuit.

[Endorsed:] Original File No. —. U. S. Circuit Court of Appeals, Third Circuit. No. 4, March Term, 1906. Eugene S. Bradford *et al.*, Appellants, *vs.* The Expanded Metal Company *et al.*, Appellees. Mandate.

385 In the Circuit Court of Appeals for the Third Circuit.

EUGENE S. BRADFORD, JOSEPH C. MILLICHAMP, N. J. SCHMUCKER, JR., and N. J. SCHMUCKER, Defendants-Appellants,

vs.

THE EXPANDED METAL COMPANY and HENRY CHESS, WALTER CHESS, and HARVEY B. CHESS, Co-partners, Trading as Chess Brothers.

And now this thirteenth day of April, 1907, come the surviving appellees into Court by their Counsel and suggest that since the filing of the opinion the Court in this case Henry Chess one of the complainants-appellees has died.

386 UNITED STATES OF AMERICA, *sct:*

I, William H. Merrick, Clerk of the United States Circuit Court of Appeals for the Third Circuit, do hereby certify that the foregoing pages from one to three hundred and eighty-five inclusive, to contain a full, complete and faithful copy of the original transcript of record in the case of Eugene S. Bradford, Joseph C. Millichamp, N. J. Schmucker, Jr., and N. J. Schmucker, Respondents-

Appellants, and, The Expanded Metal Company and Henry Chess, Walter Chess and Harvey Chess co-partners, trading as Chess Brothers, Complainant-Appellant, on file and now remaining among the records of the said court in my office.

In testimony whereof, I have hereunto subscribed my name and affixed the seal of the said Court at Philadelphia, this fifteenth day of April, in the year of our Lord one thousand nine hundred and seven, and of the Independence of the United States the one hundred and thirty-first.

[Seal United States Circuit Court of Appeals, Third Circuit.]

WM. H. MERRICK,
Clerk U. S. Circuit Court of Appeals,
Third Circuit.

387 UNITED STATES OF AMERICA, *ss:*

[Seal of the Supreme Court of the United States.]

The President of the United States of America to the Honorable the Judges of the United States Circuit Court of Appeals for the Third Circuit, Greeting:

Being informed that there is now pending before you a suit in which E. S. Bradford, J. C. Millichamp, N. J. Schmucker, Jr., and N. J. Schmucker are appellants, and The Expanded Metal Company and Henry Chess, Walter Chess, and Harvey Chess, copartners as Chess Brothers, are appellees, which suit was removed into the said Circuit Court of Appeals by virtue of an appeal from the Circuit Court of the United States for the Eastern District of Pennsylvania, and we, being willing for certain reasons that the said cause and the record and proceedings therein should be certified by the said Circuit Court of Appeals and removed into the Supreme 388 Court of the United States, Do hereby command you that you send without delay to the said Supreme Court, as aforesaid, the record and proceedings in said cause, so that the said Supreme Court may act thereon as of right and according to law ought to be done.

Witness the Honorable Melville W. Fuller, Chief Justice of the United States, the 15th day of May, in the year of our Lord one thousand nine hundred and seven.

JAMES H. McKENNEY,
Clerk of the Supreme Court of the United States.

389 [Endorsed:] File No. 20,678. Supreme Court of the United States. No. 713, October Term, 1906. The Expanded Metal Co., *et al.*, *vs.* Eugene S. Bradford *et al.* Writ of Certiorari.

390 United States Circuit Court of Appeals, Third Circuit.

EUGENE S. BRADFORD, J. C. MILLICHAMP, N. J. SCHMUCKER, and N. J. SCHMUCKER, JR., Appellants,

vs.

THE EXPANDED METAL COMPANY, HENRY CHESS, WALTER CHESS, and HARVEY CHESS, Copartners, Trading as Chess Brothers, Appellees.

Stipulation.

The Supreme Court of the United States having on the 15th day of May, 1907, issued its writ of certiorari in the above case, directing that the record and proceedings therein shall be certified by the said Circuit Court of Appeals and removed into the Supreme Court of the United States;

And Whereas a transcript of the record dult certified by the said Circuit Court of Appeals for the Third Circuit has been filed in the

Supreme Court of the United States upon the petition for the said writ of certiorari.

Now this 17th day of May, 1907, it is stipulated and agreed by counsel for the respective parties that the certified transcript of record which had been filed in the Supreme Court on the petition for the said writ shall be taken as the certified copy to be filed as a return to the said writ of certiorari, and that a certified copy of this stipulation shall be sent to the Supreme Court as the return of the Circuit Court of Appeals for the Third Circuit to the said Writ of Certiorari.

E. HAYWARD FAIRBANKS,
ERNEST HOWARD HUNTER,
Counsel for Appellees.

(Endorsed:) In the United States Circuit Court of Appeals for *for* the Third Circuit. Eugene S. Bradford, J. C. Millichamp, N. J. Schmucker and N. J. Schmucker, Jr., Appellants *vs.* The Expanded Metal Company and Chess Brothers, Appellees. Stipulation. Filed May 18, 1907.

391 UNITED STATES OF AMERICA,
Eastern District of Pennsylvania, Third Judicial Circuit, sct:

I, William H. Merrick, Clerk of the United States Circuit Court of Appeals, for the Third Circuit, by virtue of the foregoing Writ of Certiorari and in obedience thereto do hereby certify to the Supreme Court of the United States the consent of the Counsel for the respective parties thereto annexed as my return to the said writ.

In Testimony Whereof, I have hereunto subscribed my name and affixed the seal of the said Court, at Philadelphia, this twentieth day of May in the year of our Lord one thousand nine hundred and seven and of the Independence of the United States the one hundred and thirty-first.

[Seal United States Circuit Court of Appeals, Third Circuit.]

WM. H. MERRICK,
Clerk U. S. Circuit Court of Appeals, Third Circuit.

392 [Endorsed:] No. 713/20678. Term, 190-. United States Circuit Court of Appeals, Third Circuit. Certified Copy. Office of the Clerk. Received May 21, 1907. Supreme Court, U. S. 713/20678, May 21, '07.

393 [Endorsed:] File No. 20,678. Supreme Court, U. S. October Term, 1907. Term No. 289. Expanded Metal Company *et al.*, Petitioners, *vs.* Eugene S. Bradford *et al.* Writ of Certiorari and return. Filed May 21st, 1907.

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IN THE

Supreme Court of the United States.

EXPANDED METAL COMPANY AND WALTER CHESS AND HARVEY B. CHESS, COPARTNERS, LATE TRADING WITH HENRY CHESS, DECEASED, AS CHESS BROTHERS, PETITIONERS,

vs.

EUGENE S. BRADFORD, JOSEPH C. MILLICHAMP, NICHOLAS SCHMUCKER, JR., AND NICHOLAS J. SCHMUCKER, RESPONDENTS.

Respondents' Brief in Opposition to Petition for Writ of Certiorari.

Statement.

May it Please the Court:

Respondents (defendants and appellants below) submit that the petition does not present a case in the nature of any of those mentioned in Forsyth *vs.* Hammond, 166 U. S., p. 514, wherein this court, speaking of the classes of cases in which the power of the writ of certiorari might be exercised, said:

> "It is a power which will be sparingly exercised, and only when the circumstances of the case satisfy us that the importance of the question involved, the necessity of avoiding conflict between

> two or more courts of appeal, or between the courts of appeal and the courts of a State, or some matter affecting the interests of this nation in its internal or external relations, demands such exercise."

Nothing whatsoever is involved in this litigation beyond what is involved in the ordinary suit for the alleged infringement of letters patent. It involves no questions of either public policy or public interest—merely a matter of private interest—nor the determination of any constitutional question or of any new, uncertain, or complex questions of law or practice, for the issues presented upon the pleadings and proofs are simply those of the patentability of subject-matter, interpretation of claims and infringement, and require for their determination simply a recognition and application of what may be regarded as purely elementary propositions in the law of patents. It is strictly a controversy between private parties who were rivals in the business of manufacturing and selling slitted, stretched metallic sheets to which the invention of the letters patent in suit relate. Hence, there is not here present a single essential factor that would justify this court in granting the writ prayed for, unless this court is prepared to announce the rule that it will grant the writ in all cases wherein a decision by a Circuit Court has been reversed by the unanimous opinion of a Circuit Court of Appeals for that, indeed, is this case.

Squarely put, the petitioners' contention is that the Circuit Court was right and the Circuit Court of Appeals wrong, although a reading and comparison of their respective opinions clearly show that, upon both principle and reasoning, the Circuit Court of Appeals was right, since its conclusion was dictated by, and is in obedience to, the principles announced by this court throughout its entire existence.

Not only did the Circuit Court of Appeals consider and determine in favor of the appellants-defendants in the court below, all the issues involved in this controversy, which necessarily involved a consideration and determination of the correctness of the rulings of the Circuit Court, but upon a petition for a rehearing filed by these petitioners, it had submitted to it all of the alleged errors which are now assigned by the petitioners as reasons why this court should take the case for review.

So that we have not only the unanimous opinion of the Circuit Court of Appeals upon the questions presented by the pleadings and proofs, but the unanimous opinion of that court upon the very errors now assigned as reasons why this court should grant the writ here asked for, and the holding of that court that the errors so assigned are absolutely without merit either in fact or law. The petition does not show or suggest that there is any question of "peculiar gravity and general importance" for review, or any conflict between the decision of a Court of Appeals and the decisions of other circuits, nor is it even charged that the petitioner has suffered or is liable to suffer any substantial damage, hardship or inconvenience other than may arise to any complainant who is vexing and harassing a small business competitor on a worthless patent inadvertently granted by the Patent Office, which has met its deserved fate in the Court of Appeals, and which is of the same character as many of the Federal courts have held to be void on demurrer. The petition in effect concedes that the opinion of the Court of Appeals correctly states the law as administered by this court and merely complains that in applying this law to the disputed questions of fact which had to be determined upon the voluminous record and numerous exhibits before it, the Court of Appeals found these facts against the petitioners. It is not averred or pretended that any other litigation is pending nor does the petition represent that the defendants and appellants below (respondents here) have manufactured, used, or sold the infringing device in such numbers as to involve damages in any considerable amount nor do the petitioners show that they asked to have any question of law certified to this court. The petition proceeds on the presumption that because the petitioners are dissatisfied with the conclusion of the Circuit Court of Appeals on the question of the validity of the Patent, arising under an appeal from an interlocutory decree where the three circuit judges of the Court of Appeals have unanimously overruled the court below, this court should intervene by writ of certiorari, though it is not even alleged with clearness that the court has misconceived the law or that there has been any dispute of law between the several judges, or that the matter in controversy has any exceptional importance or concerns any public or general interests. The petition does not charge that the Gourt of Appeals misstated or misapprehended the law in any respect but complains of its conclusions and in effect seeks a review of the finding of the Court of Appeals upon disputed questions of fact. It can not impugn the rule of law stated in the opinion of the Court of Appeals as governing its action, for it is the law repeatedly administered by the Supreme Court. This court is asked to intervene, not for the purpose of correcting any mistake of law promulgated by the Court of Appeals, but rather to review the findings of that court concerning the weight of evidence in a voluminous record where the parties were fully heard upon oral arguments and printed briefs, where numerous mechanical exhibits were before the court and considered by it in reaching its finding and where the petition does not clearly allege any circumstance indicating special hardship or injury.

Absence of Conditions Essential to Justify Writ.

There is a glaring contrast between the showing made by this petition in this case, which seeks a review of a decision of an unanimous Court of Appeals, and the conditions stated in the opinions of this court as essential to maintain such a writ (Forsyth *vs.* Hammond, supra).

In Am. Construction Co. *vs.* Jacksonville Railway, 148 U. S., 372, this court, after referring to the fact that power to issue such a writ had "been held to be a branch of its jurisdiction, which should be exercised sparingly and with great caution and only in cases of peculiar gravity and general importance or in order to secure uniformity of decision," citing Lau Ow Bew's Case, 141 U. S., 583, and 144 U. S., 47, and In re Woods, 143 U. S., 202, added (p. 383):

> "Accordingly, while there have been many applications to this court for writs of certiorari to the Circuit Court of Appeals under this provision, two only have been granted; the one in Lau Ow Bew's case, above cited, which involved a grave question of public international law, affecting the relations between the United States and a foreign country; the other in Fabre, Petitioner, No. 1,237 of the present term, an admiralty case, which presented an important question as to the rules of navigation, and in which the decree of the Circuit Court of Appeals for the Second Circuit reversed a decree of the district judge, and was dissented from by one of the three circuit judges; and in each of those cases the Circuit Court of Appeals had declined to certify the question to this court.
>
> "There are much stronger reasons against the interposition of this court to review a decree made by the Circuit Court of Appeals on appeal from an interlocutory order, than in the case of a final decree. Before the act of 1891, as has been seen, no interlocutory order was subject to appeal, except as involved in an appeal from a final decree. The only appeal from an interlocutory

> order under the act of 1891 is that allowed by section 7 to the Circuit Court of Appeals, the same court to which an appeal lies from the final decree. The question whether a decree is an interlocutory or a final one is often nice and difficult, as appears by the cases collected in Keystone Co. *vs.* Martin, 132 U. S., 91, and in McGourkey *vs.* Toledo & Ohio Central Railway, 146 U. S., 536. Whether an interlocutory order may be separately reviewed by the appellate court in the progress of the suit, or only after and together with the final decree, is matter of procedure rather than of substantial right; and many orders made in the progress of a suit become quite unimportant by reason of the final result, or of intervening matters. Clearly, therefore, this court should not issue a writ of certiorari to review a decree of the Circuit Court of Appeals on appeal from an interlocutory order, unless it is necessary to prevent extraordinary inconvenience and embarrassment in the conduct of the cause."

In refusing to review an alleged error of the Court of Appeals, this court said (pp. 385–6) that if the court erred—

> "the error was one in the judicial determination of a case within the jurisdiction of that court, and neither so important in its immediate effect, nor so far-reaching in its consequences as to warrant this court in undertaking to control the case at this stage of the proceedings."

In the case cited from 143 U. S., 202 (In re Woods, petitioner), there were questions of law of considerable importance and there was a judgment of a substantial sum, but this court refused to issue the writ, saying (p. 206):

> "But we do not regard the inquiry as to whether it was settled law in the State of Minnesota that a judgment of dismissal in a former suit, such as pleaded here, was not a bar to a second suit upon the same cause of action, or whether the law

> in respect of recovery by a servant against his master for injuries received in the course of his employment was properly applied on the trial of this case, as falling within the category of questions of such gravity and general importance as to require the review of the conclusions of the Circuit Court of Appeals in reference to them."

Chicago & Northwestern Ry. Co. *vs.* Osborne, 186 U. S., 364, seems to treat the fact that the decision below was on an interlocutory decree as conclusive against issuing the writ, citing as authorities Rice *vs.* Sanger, 144 U. S., 197, and other cases to similar effect; and if Am. Const. Co. *vs.* Jacksonville Ry. Co., concedes the power it does not encourage its exercise.

In The Conqueror, 166 U. S., 110, it is cited as having settled that the writ is ordinarily only issued after a final decree in the Court of Appeals (p. 113).

In Charles Pope Glucose Co. *vs.* Chicago Sugar Refining Co., 170 U. S., 705, there appeared to be much stronger grounds for granting the petition than in the present case. The decision dismissing the bill in the Circuit Court had been overruled by two judges in the Court of Appeals, the third judge delivering a very vigorous dissenting opinion, holding that the patent which was sustained by the majority was invalid. His opinion was, therefore, affirmatively and strongly shown to coincide with that of the Circuit Court, which had dismissed the bill on that ground. The petition for writ of certiorari charged error of law, and further, that the decision affected very large interests of the petitioner and inflicted very serious and far-reaching damage, the extent of the business interrupted and the heavy damage to the defendant being specifically set forth. This court denied the writ of certiorari, plainly indicating that the mere fact that one of the judges in the Circuit Court of Appeals agreed with the court below was not, by itself, a sufficient reason for the issue of the writ, even where large interests of a private corporation were affected. In the present case, the decision of the Court of Appeals was *unanimous,* and the petition neither charges that the case is one of "peculiar gravity and general importance" or that the interposition of this court is necessary to secure uniformity of decision or any circumstance from which either of these conditions can be inferred. It is not shown that any application was made to the court to certify any question of law to this court nor does it clearly appear that any special hardship is inflicted or liable to be inflicted upon the petitioners. It is not even alleged that the Circuit Court of Appeals has misrepresented or misstated the law in any particular. It does not appear from the petition that there was any dispute on any proposition of law in the *unanimous* opinion of the Circuit Court of Appeals or that any novel proposition of law was announced or applied in the decision of the Court of Appeals. The law stated in the *unanimous* opinion of the Circuit Court of Appeals is so well settled by the decisions of this court that there is no occasion for it to issue this writ for the purpose of settling the law upon any point touched upon in either the opinion of the Court of Appeals or the opinion of the Circuit Court. The real complaint is not that the court misunderstood the law, but that in reviewing conflicting evidence including numerous mechanical exhibits and expert and other testimony in the light of the law already expounded by this court, it found the facts against the petitioners in respect to the patent involved in the suit. This court is asked to resolve itself into a jury to try issues of fact and ascertain whether the Court of Appeals correctly found those facts and this in a case where jurisdiction of the Court of Appeals is not questioned and where it is not alleged that the petitioners have suffered or are liable to suffer any unusual hardship or more than nominal damage (other than injury to their feelings) by holding their patent invalid. If it had been intended to have this court review every case in which the Circuit Court was *unanimously* overruled by the Court of Appeals this would probably have been made a statutory ground of appeal. But it was not. It was plainly not the intention to burden this court with cases other than those involving new questions of law of special gravity and importance, or affecting something more than ordinary and insignificant private interests.

The Assignment of Errors.

There does not appear to be any specific assignment of errors as is customary in these cases, but what is probably meant for this appears on pages 2 and 3 of petitioners' "brief and argument in support of petition." These six clauses contain much trivial, frivolous, and argumentative matter and are followed by a long discussion of points, some of which are directed to matter not appearing in the record, the impropriety of which is obvious. It seems to us that much of this matter is hardly capable of being discussed at all at this stage with entire propriety, inasmuch as the only question now to be considered is whether the petitioners have made the requisite showing to justify the intervention of this court. We contend that they have not. In order, however, that respondents' position may be fully understood it is perhaps our duty to briefly reply to these six paragraphs seriatim, as our silence may be taken as an admission of their truth in whole or in part.

Does the Case Present an Unsettled and Disputed Question of Patent Law?

In reply to the matter contained on pages 4 to 11 of petitioner's brief it is submitted that there is no unsettled or disputed question here present. It is no where asserted, even by petitioners, that there is any chemical or other elemental action present in the mechanical steps employed in the complainants' patent. In the case of Risdon Iron and Locomotive Works *vs.* Medart, 158 U. S., 68, 76, it was decided that the acts or steps of a true process must be those which result in chemical reaction or some elemental change. Hence in view of the Medart case the Court of Appeals was fully justified in applying the rule there laid down in this case. The doctrine that certain processes are not proper subject-matter for a patent has long been an established rule of law and to a few of the early cases leading up to the Medart case we will now refer. Wyeth *vs.* Stone, 1 Story, 273, 285, which is one of the first cases cited in support of this proposition, is said to show the distinction between patentable and unpatentable processes and to be the earliest reported case on that subject. In the patent in suit, the inventor, after describing a horse-machine for cutting ice and its mode of operation, had claimed, as new, the process of cutting ice "of a uniform size, by means of an apparatus worked by any other power than human." This was held to be "a claim for an art or principle in the abstract, and not for any particular method or machinery," and to be "broader than the actual invention of the patentee." It also appears to have been decided that a patentee could not go beyond his actual invention and have a valid claim for an art or principle in the abstract. O'Reilly *vs.* Morse, 15 How., 62, 112, 117, 119, decided by the Supreme Court in 1853 is to the same effect. Another somewhat similar case where the patentee had failed to claim the process he had invented was Le Roy *vs.* Tatham, 14 How., U. S., 156, and S. C., 22 How., U. S., 132. In the Morse Telegraph case after describing and claiming the several parts of his apparatus, Morse made claim, broadly, to—

> "the use of the motive power of the electric or galvanic current, . . . however developed, for

> marking or printing intelligible characters, signs, or letters, at any distances, being a new application of that power,"

of which he asserted that he was the first inventor or discoverer. Morse had unquestionably discovered a new process, which might be described as the method of transmitting intelligence to a distance by causing the making and breaking of an electric circuit at one point to produce certain conventional signs at a distant point. But, instead of claiming such a process, he made his claim to an art or principle in the abstract—to the use of a power of nature to perform an abstract function or effect an abstract result, regardless of the particular process or apparatus employed, and the court held, correctly, that his claim was "too broad, and not warranted by law," citing Wyeth *vs.* Stone as a case directly in point. Mr. Chief Justice Taney, writing the opinion, points out that, whether the telegraph be regarded as an art or machine, "the manner and process of making or using it must be set forth in exact terms," the act of Congress making no difference in this respect between an art and a machine, and thus, as had always been held, the patent embraced nothing more than the actual improvement described and claimed as new, any one being at liberty to use all methods of accomplishing the same object, which differed substantially from the one described.*

Corning *vs.* Burden, 15 How., 252, 267, also decided in 1853, appears to be one case principally relied upon by this court in the Locomotive Works case in support of this position.

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*Wicke *vs.* Ostrum, 103 U. S., 461, 469, is also cited, to the same effect, in the Westinghouse case (170 U. S.) infra; but in that case it was held simply that while the patentee could not patent, "the idea of driving more than one nail at the same time in the manufacture of boxes by the use of machinery," he could claim, as his patent merely did, his contrivance to make that idea practically useful.

In the Burden case the case turned upon the proper construction of the claim of the patent in suit. The declaration averred that the patentee was "the first inventor of a new and useful machine for rolling puddle balls," for which a patent was granted in 1840, and that the defendants had "made, used, &c., this said new and useful machine." The patent itself was entitled and its specification described, "a new and useful machine for rolling puddle balls and other masses of iron in the manufacture of iron;" but the claim, in rather ambiguous language, was for "the preparing of the puddle balls . . . by causing them to pass between a revolving cylinder and a curved segmental trough adapted thereto, constructed and operating substantially in the manner of that herein described and represented." The court below construed the patent as for a new process and so instructed the jury, who returned a verdict for the plaintiff. On exception to this charge the Supreme Court reversed the judgment and awarded a new trial. Prior to the Risdon case were three cases wherein processes were claimed which do not seem to invoke any power of nature to aid in effecting the desired result. In Eames *vs.* Andrews, 122 U. S., 40, the claim sustained was for—

> " the process of constructing wells by driving or forcing an instrument into the ground until it is projected into the water without removing the earth upward, as it is in boring, substantially as herein described."

In Topliff *vs.* Topliff, 145 U. S., 156, the patent contained two claims, both of which were sustained, the first being for "the herein-described method of equalizing the action of springs of vehicles and distributing the weight of the load," namely, by "connecting together by a rigid rod the two pivoted links upon the clips employed on the hind axle."

And in Hoyt *vs.* Horne, 145 U. S., 302, the claim on which a decree for the complainant was directed was as follows:

> "The improvement in beating rags to pulp in a rag engine having a beater-roll and bed-plate knives, consisting in circulating the fibrous material and liquid in vertical planes, drawing the same between the knives at the bottom of the vat carrying it around and over the roll and delivering it into the upper section of the vat, substantially as described."

In the opinion in the Risdon Locomotive Works *vs.* Medart case the general proposition "That certain processes of manufacture are patentable is as clear as that certain others are not," is first announced; and this is explained by the further statement that, generally speaking, "processes of manufacture which involve chemical or other similar elemental action are patentable, though mechanism may be necessary in the application or carrying out of such processes, while those which consist solely in the operation of a machine are not," the operation then being "purely mechanical." Next, after reviewing two English cases and its own decisions in O'Reilly *vs.* Morse, Mowry *vs.* Whitney, Cochrane *vs.* Deener, Tilghman *vs.* Proctor, New Process Fermentation Co. *vs.* Maus, and the Telephone cases, and observing that, in all these cases, the process sustained was either a chemical one, or consisted in the use of one of the agencies of nature for a practical purpose, it prefaces its reference to Wyeth *vs.* Stone and Corning *vs.* Burden by the statement that "it is equally clear, however, that a valid patent can not be obtained for a process which involves nothing more than the operation of a piece of mechanism, or, in other words, for the function of a machine." And, finally, it states that "this distinction between a process and a function has never been departed from by this court."

Following the Locomotive Works case came the Air Brake case, Westinghouse *vs.* Boyden Power Brake Co., 170 U. S., 537, 556, and whatever is said upon this subject of process claims in the Air Brake case, is admittedly obiter dictum. Three other cases involving process claims have been decided by the Supreme Court since the Westinghouse case. The process was held void for want of novelty in one, United States Repair and Guarantee Co. *vs.* Assyrian Asphalt Co., 183 U. S., 591, and was sustained in another, Carnegie Steel Co. *vs.* Cambria Iron Co., 185 U. S., 493; but both of these processes involved the element of heat and probably some chemical action as well, and the subject of their patentability as processes was not discussed. The third case was Busch *vs.* Jones, 184 U. S., 598, wherein the process claim was held invalid.

However, whatever may have been involved in doubt and uncertainty in the prior cases was dispelled in the rule enunciated in the Locomotive Works case, which has been repeatedly applied in the vast array of cases to which we shall briefly refer under the caption of the "Law of the Case."

Remaining Assignments Suggest No Error of Law, But Merely Seek a Review of the Evidence to Which the Court of Appeals Applied the Law Repeatedly Enunciated by the Supreme Court.

Much that is pertinent here has already been said in the opening statement. The second assignment to the effect that the question involves uniformity in the application of the principle of patent law by the courts of different countries is wholly frivolous and irrelevant. Furthermore, it does not appear from this record that the petitioners own any foreign patents since the numbers and dates of these are carefully concealed. The discussion of the English cases in petitioner's brief while interesting and entertaining does not seem to be relevant at this stage. The remaining assignments of errors raise no novel question of law and carry no implication that the Court of Appeals has laid down or applied any new or unusual rule of law. The review asked for will be necessarily a review of the evidence and findings based upon evidence concerning only the parties to this controversy. Certainly there is suggested no question of law requiring adjudication by this court and no question of any kind of such public interest or general importance as to command the intervention of this court. The discussion in the petitioners' brief in support of the petition proceeds upon assumptions and allegations concerning the facts in controversy which do not represent facts conceded to exist, but rather petitioner's contentions concerning the effect of the evidence upon matters in dispute—contentions which have been wholly rejected or overruled by the Court of Appeals. This discussion ingeniously ignores the real state of facts exhibited in the record and found by the court, and seeks to place upon the evidence an unwarrantable construction. It should not be necessary here to discuss these various assertions or to specify particularly the discrepancies between the petitioners' statement of facts and issues and the facts and issues actually presented in the record and found by the court, for the absence of the conditions necessary to invoke this petition is so obvious that the time of this Court ought not to be occupied in reviewing this evidence. But it is due the Court of Appeals to refer to some of the vital distinctions between the state of facts upon which that court has passed and the fanciful references to them in the petitioners' brief. It will appear that the evidence before it justified the relief given under the law as administered by this court, and that it had no occasion to invoke or apply any novel proposition of law.

The State of the Art.

As is usual in this class of cases, great merit is claimed for Golding, the patentee, on account of what he is alleged to have accomplished, and thereby it is sought to invest the present invention with all the credit of such accomplishment. Now the facts are:

1. That Expanded Metal was a known thing in the art something over twenty years before Golding entered it. This fact is admitted to be true.

2. That during the ten years which intervened between Golding's first Expanded Metal Patent in 1884, and the patent in suit in 1894, he had invented and patented every element of his present invention in a practicable and commercially operative form, having during that time taken out either in his own name or jointly with Durkee, no less than five other patents.

This fact is admitted to be true as to two features of the alleged invention—that is, as to slitting the sheet and opening out or "deploying" the strands; but as to the third feature, stretching the strands, it is claimed by Golding, that in his prior patents, the amount of stretching was very small, and only such as was incidental to shearing the slits—of which more presently.

3. This brings us to the third fact, also undisputed, that prior to the present invention, and in the manufacture of sheet-metal lathing—that being one of the important uses of the present invention—metal strands had been slitted and stretched and by a stretching fully equal in amount to Golding's stretching, and effected as in Golding's by the prolonged action of the slitting dies.

And these facts being true, we contend that Golding was not entitled to a method claim for his present invention, and that his present patent is void. His machine patent, No. 581,713, subsequently obtained (Rec., p. 253) fully covers all that he invented therein of a patentable nature, as can readily be seen by the perusal of Claim 1 of that patent (Rec., p. 256).

Golding Patent, No. 296,382.

This patent dated April 22, 1884 (Rec., p. 99), marks Golding's entrance into the art. In this patent, he claimed the very thing which he now calls "Expanded Metal," and which was such under his own definition (Rec., p. 230).

The complainant herein brought suit on that patent, and it was held invalid by the Court of Appeals, Eighth Circuit (111 F. R., 395, and not infringed), on the prior Long English Provisional publication of 1862 (Rec., p. 287).

Hence Golding was not the originator of "Expanded Metal." It was 22 years old when he entered the art.

Nor can Golding now be heard to say, as he says by his testimony, expert, and counsel, that his 1884 patent was crude, inoperative, and of no value in the art; and this in view of the fact that he or his company invoked the aid of the United States courts to establish its validity as something of such great value, that under it his company should have a monopoly of "Expanded Metal," as made today. For such was what the defendant used in the case above cited, as appears from the following extract from the opinion of the court (111 F. R., 397):

> "The method adopted by the defendants was to cut a small strip from near the edge of the metal, and then open it by forcing it downward in a line at right angles to the plane of the sheet."

But this particular way of making "Expanded Metal"—that is, as described in patent 297;382—was used commercially, as admitted by Mr. Golding himself, and therefore must be regarded as commercially operative (Rec., p. 26, Int. 2).

The Johnson English Patent.

In 1885, a year or so later, Johnson procured an English Patent, No. 11,332 (Rec., p. 293) for the same invention as that of Long and Golding above discussed, but with this addition, that the sheet after being opened out is represented as of the same length as the original sheet.

Even Golding admits (p. 64) that Figure 2 of the drawing of Mr. Johnson's British patent of 1885, represents a marketable and merchantable sheet of completed expanded metal.

Golding Patent 320,240, June 16, 1885.

This patent (Rec., p. 103) next in order, purports to cover the method of making the product of the former 1884 patent 297,382. As we shall presently see, Golding has no less than three method patents for "Expanded Metal," of which this is the first. In his testimony he calls this his "first process."

How a party can be entitled to three method patents for making the same product is something which passes our comprehension. We have searched the reports in vain to find a case in which a second or (as here) a third method patent for making the same product, was ever sustained or even sued on. In that respect, the present suit is believed to be the first of its kind. For making one mechanical product there can not be more than one mechanical method in a patentable sense, and sometimes not that.

Golding and Durkee Patent 320,241.

It thus appears that in 1884 and 1885, Golding patented "Expanded Metal" broadly, as he supposed, and also a commercially practicable method of making it. Thereafter, as we contend—and much more so nine years later—there was no room for the exercise of invention except in the devising of new apparatus for more economically or more rapidly doing the work. The former way of making the article, though practically operative, was unsatisfactory; a better structure of machine was required. Accordingly, Mr. Golding, after speaking of his two former patents, says (Rec., p. 10).

> "I had determined in my own mind that expanded metal could not be a commercial article until I could devise a machine which would both cut and open the metal in a single operation; . . ."

Such a machine is shown in the patent of Golding and Durkee, No. 320,241 (Rec., p. 115). In the operation of this machine it followed that as the slitted strands were bent down and opened out, the sheet was shortened somewhat, and to an extent depending upon the length of the cuts and the angle to which they are opened out, but at the same time the act of expanding elongated the sheet correspondingly. The loss in length was compensated by a much greater increase in width, as will presently appear.

Golding and Durkee Patent 320,242.

This is Golding's second method patent (Rec., p. 121), and is based on the particular or peculiar way of slitting and opening of his machine patent last above referred to. We refer to it chiefly to note the erroneous idea or theory which Mr. Golding seems to have entertained, that on every new machine which he invented, he was entitled to a method patent. Such is not the law, and never was (Coombs, Rec., p. 197).

Golding and Durkee Patents 381,230 and 381,231.

These (Rec., p. 271 and p. 137) both are machine patents, like 320,241, and of the same general character, and doing the same work in substantially the same way. Apparently they were invented in order to overcome or obviate the real or supposed defects of 320,241. All three seem to embody the alleged method of 320,242 (Rec., p. 197).

Machines of this type went into use, and a few are in use yet (Rec., p. 30, q. 12).

Thus, confining ourselves for the present to the Golding and Durkee patents alone, we have in the "Expanded Metal" art, as it existed in 1888:

First, slitting the sheet continuously from end to end by a single operation as in patents 297,382 and 320,240, and then laterally expanding it.

Second, slitting and opening out the strands along the edge of the sheet, one row at a time, and the different rows in succession, by a guillotine or chopping and shearing operation, as in patents 320,241, 320,242, 381,230, and 381,231.

Third, a partial stretching of the strands so slitted and opened out. How much this stretching amounted to does not appear, but there was enough to be observable to the ordinary onlooker, and that was enough for our present purpose.

Bradford, who saw one of these machines in operation "six or eight times" (Rec., p. 181, x-q. 7), says that they stretched the strands "to a certain extent" (Rec., p. 174, q. 14), which of course means to an observable or noticeable extent.

Golding himself admits that such stretching took place in the operation of one of these old machines (Rec., p. 31, q. 17).

These facts being so, it obviously follows that there could have been no patentable novelty, nine years later, in a method based on the alleged novelty of stretching the strands.

The Ohl Patent, 475,700, May 25, 1892.

During this nine-year interval, and something over two years prior to the patent in suit, a patent was granted to Ohl, No. 375,700, for Machine for Making Metal Lathing (Rec., p. 285), in which metallic strands (S′) were slitted and stretched and in alternate arrangement and were stretched as much and stretched in the same way as Golding stretches them by the patent in suit—that is by the downward thrust or movement of the full, flat-ended or blunt middle portion of the slitting die. This fact is made prominent in Ohl's specification, thus:

> "At the same time, stretching the strip longitudinally" (p. 1, ls. 40, 41).
>
> "Stretching it (the strip) longitudinally and shaping it as desired" (p. 1, ls. 81, 82).

The mode of operation described in the Ohl patent is identical with the supposed method of the patent in suit in respect of all the elements of the patent which are alleged to be new. The only difference is that Golding produces a sheet of metal lathing which is expanded lengthwise, while Ohl's lathing is only expanded downwardly, but the edgewise expansion of the sheet was old and the only novel feature which is alleged, namely, simultaneous stretching of the strands and the preserving unaltered the original length of the blank is also characteristic of Ohl's machine.

Hence, independently of the stretching which Golding himself had done in the working of his previous patents, it thus appears that prior to the invention of the patent in suit, the stretching of slitted metallic strands, both the slitting and stretching being done in one operation, and in the manufacture of this same class of material or product, and in alternate arrangement, was a recognized and well-known part of the art.

The Patent in Suit, No. 527,242.

In the specification (Rec., p. 95) there is a general and brief recognition of the prior art, except as to stretching. Not a word is said as to the stretching (whether much or little) which, as Golding must have known, was a characteristic of the product of his prior machines. To that extent he was guilty of withholding from the Patent Office a material fact within his knowledge, and but for which it is at least doubtful if his patent would have been granted. Nor does his specification say anything about Ohl's stretching.

The Only Novelty of the Invention here in Question Resides in the Machine or Mechanism Employed to Operate it. The Alleged Method which it Claims is a Mere Function of the Old Mechanism Employed; and both being Old, there can be no Novelty of Method and the Patent is therefore Invalid.

We deem it unnecessary to here further analyze or discuss the patent in suit as that has been done by his Honor, Judge Dallas, speaking for the Court of Appeals, to whose decision in this matter at the back of the transcript your Honor's attention is respectfully directed.

Before taking up the law of the case we will briefly reply to sundry collateral matters referred to by the petitioners.

Alleged Revolution in the Art.

It is a matter of common knowledge that within the past ten or twelve years, the use of cements, mortars, and plasters in "sky-scapers," piers, retaining walls, etc., has been enormously increased, and that such use has greatly enlarged the demand for "expanded metal."

From which it may be a reasonable inference that the "Revolution in the Art" claimed for Mr. Golding, is due quite largely to the Evolution of the Art of Architecture, and to an increased demand resulting therefrom.

We do not deny, and have not denied that Mr. Golding has perhaps made an invention of merit and value, but it is an invention of a machine and not of a method; and his machine patent No. 581,713 (Rec. p, 253) gives him all the protection to which, as an inventor, he is entitled.

Shortening The Sheet.

It is admitted and asserted that the really meritorious feature in which the whole novelty and merit of the present alleged improvement resides is the elongation or stretching out of the strands simultaneously with the operation of cutting and bending. Thus on page 31 of petitioners' brief appears the following:

> "Golding did not invent or first suggest the separate operations. The operation of simultaneously cutting and bending metal so as to stretch the strand was old. What Golding discovered or invented was the method of repeating that old operation in such a way that the two operations would combine to produce a new result by reason of their combination."

If this be true then it is an end of the present case, for these features are found in a limited but appreciable degree in the Golding 1885 and 1888 patents, and are also found in the prior Ohl patent, as fully and as completely and as clearly as in the patent in suit. In respect of method, Mr. Golding has invented nothing, and his patent is therefore invalid.

Before concluding we desire to call attention to the following which appears at the bottom of page 21 of petitioners' brief:

> "The novelty and utility of the complainant's process was not seriously attacked either in the Circuit Court or in the Court of Appeals."

And also to the statement at the bottom of page 34 thereof:

> "Nor is there any merit in the suggestion that the patentee has not adequately disclosed his invention. No such question was raised by the defendants."

Both these statements are wholly without warrant and are untrue and in absolute variance and disregard of the true facts. In both the Circuit Court and the Circuit Court of Appeals the defendants-appellants (respondents here) argued at length both orally and in the briefs that there was no novelty or utility in the complainants' process nor had the patentee adequately disclosed the alleged invention.

Law of the Case.

Returning now to the question of patentability, we confidently submit that under the facts herein appearing, the Circuit Court of Appeals did not err in holding the patent in suit to be for unpatentable method or process. That decision is wholly in accord with the authorities.

In Robinson on Patents, Sec. 509, it is stated:

> "Patents are not granted for abstract ideas, principles, modes of operation, functions or results

> of machines, but underlying every patentable invention is the idea of means. The thing patented is the concrete expression of this idea, the mechanism by which it is reduced to practice (Burr *vs.* Durkee, 1 Wall., 532; O'Reilly *vs.* Morse, 15 How., 62). It is this which must be set forth in the claim in distinction from the discovery or conception, idea or mode of operation which it embodies."

In O'Reilly *vs.* Morse, 15 How., 52 supra, the court said that a claim is void which, expressly or in effect, is for "all modes of effecting the results stated," as the patentee would be claiming something which he did not invent, or, if invented, which he did not teach the public, or which would include subsequent discoveries.

In the decision of this court in Ridson Iron and Locomotive Works *vs.* Medart, 158 U. S., 68, 71, it was held that claims involving purely mechanical steps, such as those in the patent here in suit, are invalid. In that case the patent was for an improved process in manufacturing belt pulleys, formed of a wrought metal rim and a separate centre, usually a spider, and usually made of pressed metal.

> "The process of manufacture. . . . consists of the following steps: (1) centering the pulley center or spider; (2) grinding the ends of the arms, concentrically with the axis of the pulley; (3) boring the center; (4) securing the rim to the spider; (5) grinding the face of the rim concentric with the axis of the pulley; and (6) grinding or squaring the edges of the rim."

It was held by the Supreme Court that on the face of the patent it could not be sustained for the mere operation of a piece of mechanism or, what was the same thing, for a series of mechanical steps or for the function or functions of a machine.

The same principle has been applied in a multitude of cases, including the case at bar, wherefrom we select the following as especially applicable under the proposition that such mechanical processes or methods as this is are not patentable under the law.

In McKay *vs.* Jackson, 12 F. R., 615, Judge Wheeler said:

> "A mere process for making an article is not of itself a patentable invention."

In Brainard *vs.* Cramme, 12 F. R., 621, the court held a process for washing shavings in breweries to be invalid, on the ground that it was nothing more than the employment of the described apparatus.

In Gage *vs.* Kellogg, 23 F. R., 891, a claim for an improved method of treating seed by steam was held invalid.

In Hatch *vs.* Moffitt, 15 F. R., 253, the claim in controversy was a process for crimping heel stiffenings of boots and shoes. This was declared invalid as being merely for a mode of operation.

In Excelsior Needle Co. *vs.* Union Needle Co., 32 F. R., 221, the patentee of a machine for producing needles of a superior quality subsequently obtained a patent upon the product of such machine. This later patent on the product was held by the court to be invalid, as being an attempt to patent a function of a machine.

In Wells Glass Co. *vs.* Henderson, 67 F. R., 930, the Henderson Patent 412,751, was for a process of manufacturing metallic cross bars and rails for window sashes and analogous structures, and was held invalid as covering a purely mechanical process.

In International Tooth-Crown Co. *vs.* Bennett, 72 F. R., 169, the claim for a method of fixing artificial teeth in the mouth was declared invalid.

It is true that in this case the defenses of prior use were set up, but no one can help seeing, upon reading the opinion, that if it had been necessary, Judge Wheeler would not have hesitated to declare this type of claim invalid in view of Risdon *vs.* Medart, since in the middle of page 170, the court said:

> "The method is wholly mechanical, and is said now, in view of Locomotive Works *vs.* Medart, 158 U. S., 68, decided since, not to be patentable."

In Strom Mfg. Co. *vs.* Weir Frog Co., 75 F. R., 279, the process claim involved was held invalid as being for purely mechanical steps, relating to the treatment of a metal blank, somewhat similar to Golding's. Here the dismissal of the bill was ordered on demurrer, on the authority of Risdon *vs.* Medart.

This case was affirmed by the Circuit Court of Appeals for the Sixth Circuit in Strom *vs.* Weir, 83 Fed., 170.

In Blakesley Novelty Co. *vs.* Connecticut Web Co., 78 F. R., 480, the mechanical method claim was declared invalid.

In the case of Travers *vs.* Hammock and Fly-Net Co., 78 F. R., 638, the claims sued on were for mechanical operations. In this case, as in the Weir Frog case, supra, the invalidity of the claims was so apparent that the court held the claims invalid upon demurrer under Risdon *vs.* Medart.

In Goldie *vs.* Diamond State Iron Co., 81 F. R., 173, the same principle was recognized by the court.

In Gindorff *vs.* Deering, 81 F. R., 962, the method claims there under consideration, merely recited a series of mechanical steps. Judge Grosscup, declaring these claims invalid, found as follows:

> "The two last-mentioned claims are process claims. It is my opinion that under the case of Locomotive Works *vs.* Medart, 158 U. S., 68, 15 Sup. Ct., 745, these claims can not be sustained.

> Except for the described functions of the machine, there is nothing more stated in the patent than the fact of a manual transposition of the sickles after their outer edges have been serrated, so that the inner edges may undergo a like operation. Such transpositions, superadded to the functions of the machine, do not make the treatment a method or process of art, such as the patent law contemplates."

In Pratt *vs.* Thompson & Taylor Spice Co., 83 F. R., 516, one of the process claims there at issue appears from page 518 of 83 Fed., to read as follows:

> "(2) The process of treating nuts, which consists in tumbling them to cleanse them on their surfaces, and then coloring them by tumbling them with dry, pulverized coloring matter, substantially as described."

These claims were held by Judge Grosscup to be invalid on the authority of Corning *vs.* Burden, 15 How., 252, referred to Locomotive Works *vs.* Medart, 158 U. S., 68.

In Rynear Co. *vs.* Evans, 83 F. R., 696, where the process of swagging up metal blanks into articles of manufacture, was applied to the making of artificial tooth crowns or caps, Judge Coxe declared the patent invalid for the said reason.

In American Strawboard Co. *vs.* Elkhart Egg Case Co., 84 F. R., 960, wherein a method of forming egg cases from strawboard was involved, Judge Baker declared the alleged method claims under consideration invalid under Risdon *vs.* Medart.

In Stokes Bros. Co. *vs.* Heller, 96 F. R., 104, the Stokes Patent No. 408,936, for a process or method of forming teeth on a rasp blank, was held to be void under Risdon *vs.* Medart as covering the mere mechanical operations or functions of the machine.

In Dodge Manufacturing Co. *vs.* Ohio Pulley Works, 101 F. R., 584, the method claim there under consideration, which involved the step of glueing, was declared invalid under Risdon *vs.* Medart.

In Dodge Mfg. Co. *vs.* Collins, 106 F. R., 35, the Circuit Court for the Fourth Circuit again applied this rule, and held the method claim invalid under the Risdon *vs.* Medart case.

In Ballou *vs.* Potter, 88 F. R., 786, which was for an improved process of manufacturing safety pins, Judge Brown again refers to Risdon *vs.* Medart in holding the claim invalid.

In Cleveland Foundry Co. *vs.* Detroit Vapor Stove Co., 131 F. R., 742, the process claim reads as follows:

> "The process herein described of converting liquid hydrocarbon into vapor and conveying and burning the vapor, which consist, first, in vaporizing the oil by exposure to a heated surface, then conveying the vapor by gravity to the points where it is to be burned, and then supplying air to the vapor in limited quantities to meet the demands of combustion, substantially as described."

On the subject under consideration, Judge Swan, at the bottom of page 742, 131 Fed., said as follows:

> "It has been held that there can not be in the same patent a claim for a machine and a claim for a process of using that machine. Gage *vs.* Kellogg, 23 Fed., 893, 894, and cases cited. This would make the fifth claim of doubtful validity. The 'process' it describes is nothing more than a claim for the operative effect or function of a vapor burner. This is not patentable. Risdon Iron and Locomotive Works *vs.* Medart, 158 U. S., 77–79; Westinghouse Co. *vs.* Boyden Power Co., 170 U. S., 555–557."

This court again in the Air Brake case, 170 U. S., 562, made reference to Risdon *vs.* Medart, and distinctly reiterated that the function of a machine or the recital of the mere mechanical steps carried out in a machine can not form subject-matter for a valid claim.

In this case Mr. Justice Brown said:

> "The difficulty we have found with this claim is this: That if it be interpreted simply as a claim for the function of admitting air to the brake cylinder directly from the train pipe, it is open to the objection, held in several cases to be fatal, that the mere function of a machine can not be patented."

Citing Corning *vs.* Burden, 56 U. S., 15 How, 252.

Burr *vs.* Duryee, 68 U. S., 1 Wall., 531, 570.

Fuller *vs.* Yentzer, 94 U. S., 288.

Risdon Iron and Locomotive Works *vs.* Medart, 158 U. S., 68, and

Wicke *vs.* Ostrum, 103, U. S., 461, 369.

In its late utterance on the subject, in the case of Busch *vs.* Jones, 184 U. S., 598, this court held the following process claim to be invalid:

> "The process herein described for treating folded printed sheets of paper in dry-pressing, the same consisting of subjecting a collection of such sheets to pressure without the use of fuller-boards, and while under such pressure tying them into a compact bundle with end-boards, then removing them immediately from the press, and allowing them to remain tied sufficiently long to fix and complete dry-pressing."

In disposing of the claim under consideration the Supreme Court said, by Mr. Justice McKenna:

> "What, indeed, is the process? What is the force at work? And the inquiry is entirely independent of questions as to what constitutes a patentable process discussed by this court in Risdon Loco-

> motive Works *vs.* Medart, 158 U. S., 68, and in Westinghouse *vs.* Boyden Power Brake Co., 170 U. S., 537. What, then, is the force at work, and how is it applied? It is force (pressure) applied to sheets of paper placed between 'compressing-heads.' In other words, a special application of pressure began in the press and continued in the bundle by means of strings and cords. This, however, is the operation and effect of the machine, and it is none the less so because the pressure is held indefinitely. Its existence in the bundle is not independent of the press. The pressure is as much an effect in the bundle as when first applied. The pressure is applied by the press, and so, substantially, are the bands or cords which continue the pressure, and we can not assent to the view that the continuation of the pressure in the bundle with the consequence of removing type indentations in the printed sheets is anything but the natural and direct effect of the machine."

It is thus abundantly shown by the uniform current of authority that in not a single case has a claim of the character of the claim of the patent in suit been sustained by any Federal court. On the contrary, in several instances that we have enumerated, claims of the precise character of the claim here in suit, comprising merely a recital of some mechanical steps for cutting, bending or otherwise distorting or treating a blank or sheet of metal or what not, have been held void upon demurrer.

Petitioners' Citations.

The cases cited hereunder on part of petitioners, are not understood to be at variance with our position.

In Cochrane *vs.* Deener, 94 U. S., 780, the material acted on (Wheat) was "transformed or reduced to a different state of things" (Flour). In the case at bar, we have no such action, but merely a change from one old shape to another old shape, and by an old method.

In Simonds Co. *vs.* Hathorn Co., 90 F. R., 201, the method claim was apparently sustained on the metallurgic action resulting from the operation of the rolling dies on hot metal under new and peculiar conditions.

In Melvin *vs.* Potter, 90 F. R., 151, Judge Dallas sustained the patent on the precise lines laid down in Risdon *vs.* Medart, to wit, that a chemical or similar action was present.

Of the other three cases cited, one Travers *vs.* American Cordage Co., 64 F. R., 771, relates to a process of manipulating threads, wherein the invention consists in the manipulation.

The other two cases, referred to in the Court of Appeals, Union Paper Bag Mfg. Co. *vs.* Waterbury, 30 F. R., 389, and Eastern Paper Bag Co. *vs.* Standard Co., 39 F. R., 63, both paper bag cases, are of like character. The invention consisted in manipulation.

The citation of Peters *vs.* Union Biscuit Co., 120 Fed., 679, on page 9 of petitioners' brief is evidently an inadvertence, as the patent there was declared invalid on appeal (125 Fed., 601).

Obviously none of these cases are fair precedents herein.

We see no reason why the foregoing fundamental principles which have been enunciated and applied for several decades should be overruled or set aside on such a showing as these petitioners have made.

Conclusion.

No public interest is involved. No conflict of opinion exists. No manifest error appears. The petition should be denied.

Respectfully submitted.

E. HAYWARD FAIRBANKS,
Of Counsel for Respondents.

PHILADELPHIA, PA., *April 29, 1907.*

No. [redacted] [redacted] 66.

IN THE

Supreme Court of the United States.

Office Supreme Court, U. S.
FILED.
APR 25 1907
JAMES H. McKENNEY,
CLERK.

IN EQUITY.

EXPANDED METAL COMPANY and WALTER CHESS and HARVEY B. CHESS, Co-Partners, Late Trading with HENRY CHESS, Deceased, as CHESS BROTHERS,

Petitioners,

v.

EUGENE S. BRADFORD, JOSEPH C. MILLICHAMP, NICHOLAS J. SCHMUCKER, JR., and NICHOLAS J. SCHMUCKER,

Respondents.

On Petition for Writ of Certiorari to the United States Circuit Court of Appeals for the Third Circuit.

Brief and Argument in Support of Petition.

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IN THE

Supreme Court of the United States.

IN EQUITY.

EXPANDED METAL COMPANY AND WALTER CHESS AND HARVEY B. CHESS, CO-PARTNERS, LATE TRADING WITH HENRY CHESS, DECEASED, AS CHESS BROTHERS,

vs.

EUGENE S. BRADFORD, JOSEPH C. MILLICHAMP, NICHOLAS J. SCHMUCKER, JR., AND NICHOLAS J. SCHMUCKER,

On petition for writ of *certiorari* to the United States Circuit Court of Appeals for the Third Circuit.

BRIEF AND ARGUMENT IN SUPPORT OF PETITION.

This is a petition for the writ of *certiorari* under Section 6 of the Act of Congress, entitled, "An act to establish Circuit Courts of Appeals and to define and regulate in certain cases the jurisdiction of the Courts of the United States, and for other purposes," approved March 3d, 1891.

This is a suit by bill in equity for the infringement of a patent and therefore is not appealable to this Court under said Act.

The writ of *certiorari* is asked on the following grounds:

(1) The case involves an unsettled and disputed question of patent law, *i. e.* the patentability of that class of processes which do not involve "chemical action" or "elemental change." This question is constantly arising in the inferior courts and in the Patent Office, and the conflicting decisions which have been rendered have produced an unsettled condition, which can be removed only by the decision of this Court.

(2) The question involves uniformity in the application of the principles of patent law by the courts of different countries. This point is particularly involved in this case because foreign companies are operating under patents identical with that which is here involved.

(3) The case was, as we believe, decided on a false standard of patentability. The only true standard of patentability is that the improvement, whether it be for an art, machine, manufacture or composition of matter, shall be new and useful and the result of an exercise of the inventive faculties.

(4) The question is directly presented by the patent in this case; and possibly no better patent could be selected for the purpose of considering it.

(5) The evidence shows that the patented process was new and useful, and the result of an exercise of the inventive faculties, that is, was for an invention distinct from a machine or manufacture, and, if not patentable as an art or process, was not susceptible of protection under the patent laws in this country, though entitled to such protection abroad.

(6) The question is of the very greatest importance not ony to inventors, but to manufacturers and all persons

interested in industries which are founded on patents; and it is to the public interest that the question should be decided. The decision of the Court of Appeals in this case, if it is in fact erroneous, will tend greatly to increase the existing doubt and confusion, and will establish a precedent seriously inimical to the manufacturing interests of the country and to the capital invested therein.

HISTORY OF THE CASE.

The Expanded Metal Company, a Missouri corporation as assignee of letters patent No. 527,242, for a method of making expanded sheet metal, granted October 9th, 1894, on the application of its assignor, John F. Golding, and Henry Chess, Walter Chess and Harvey B. Chess, of Pittsburg, composing the firm of Chess Brothers, as exclusive licensee under the said patent for the States of New York, Pennsylvania, West Virginia and Ohio, filed their bill of complaint in the Circuit Court for the Eastern District of Pennsylvania on April 30, 1903, against Eugene S. Bradford, Joseph C. Millichamp, Nicholas J. Schmucker, Jr., and Nicholas J. Schmucker, all of Philadelphia, for an injunction, damages and accounting for the infringement of the patent.

The defendants answered denying infringement and alleging the invalidity of the patent for want of utility, lack of patentable subject matter as a method or process, and anticipation and lack of invention in view of the prior art.

The cause was heard on the proofs in support of the pleadings, and on March 30th, 1905, his Honor, Judge Holland, filed an opinion sustaining the bill and awarding an injunction (136, Fed. Rep. 870, Rec. p. 315).

From an interlocutory decree entered April 6th, 1905, in accordance with that opinion the defendants appealed to the Circuit Court of Appeals for the Third Circuit. On September 10th, 1906, the latter Court reversed the Circuit Court in an opinion filed by his Honor, Judge Dallas, in which the patent was held invalid on the ground that its subject matter was not for an invention at all within the meaning of the patent laws on the principles laid down by the Supreme Court in Risdon Iron and Locomotive Works *vs.* Medart.

A petition for rehearing was filed October 9th, 1906, and was denied October 16th following.

I. THE CASE PRESENTS AN UNSETTLED AND DISPUTED QUESTION OF PATENT LAW.

The American patent law as it now exists constitutes a clearly defined and distinctive branch of American jurisprudence; so much so that it is practiced almost exclusively by a special class of "patent lawyers," and has its own Patent Bar Association. Its principles and rules are generally clearly defined and ascertained. In most cases the only question presented to the Court is that of the application of those established principles and rules to the facts of the particular case.

This system has been a gradual growth, and is the result of the application by this Court of the fundamental principles governing the right of limited monopolies, as defined by the Constitution, to the needs and conditions of the nation. As this Court has from time to time in the past pointed out by its decisions the defects in the statutory provisions for adequately defining and enforcing such rights, legislation has been framed to remedy the defects, to extend the protection, or to curtail the abuses.

While it is true that as a result of these judicial decisions and of the statutes enacted to carry these principles into effect, there has grown up this clearly defined and distinctive branch of the law, there is, unfortunately, one question—fundamental and wide-reaching in its character—which this Court has never determined and which is still, in this country, the subject of doubt and dispute. That is the question of what constitutes a "process" or "method," susceptible of protection as an "art" under the Act of Congress.

The Act provides (Rev: Stat: 4886) that,

> "any person who has invented or discovered any "new and useful art, machine, manufacture or com-"position of matter, or any new and useful improve-"ment thereof,"

may, under certain conditions, and upon complying with certain regulations secure a patent in accordance with the provisions of the Constitution empowering Congress to secure for limited times to inventors the exclusive right to their discoveries.

A "machine," a "manufacture," a "composition of matter" can be easily understood. Inventions of these kinds have never given any difficulty, and the Courts have had merely to determine the question of whether the particular improvement or discovery presented by the patent was one which involved an exercise of the "inventive" faculties and constituted an invention within the meaning of the Acts of Congress and the intent of the Constitution. But what is meant by the term "art," as used in the Act is not so easily understood. It has been recognized that those improvements or discoveries usually described as "methods" or "processes" are "arts," and that such "methods" or "processes" consist in a series of acts or operations, as distinguished from the instrumentalities which perform the acts, or the thing which is produced. The instrumentalities constitute a "machine," the thing produced is a "manufacture," or a "composition of matter," but the art, method, process or "series of acts," by which the thing is produced, is something different. Old instrumentalities may be used, and the thing produced may have been known, yet there may have been discovered a new method of production, by which former methods have become greatly simplified and cheapened, and such new method may have been the result of an exercise, in the highest degree, of those faculties called inventive.

This Court has recognized that such new methods or processes of producing a manufacture or composition of matter constitute that class of inventions defined as "arts" in the Act of Congress, and that an "art" cannot be anything else. At the same time this Court had said in certain cases that certain acts do not constitute a patentable process, while other acts do constitute such a process. It is clear from the decisions that a patentable art or process consists of a series of physical acts performed upon an article to transform it or to change its character, but it is not clear what kinds of physical acts must be performed to render the process patentable.

A patentable process was defined by Mr. Justice Bradley in *Cochrane* vs. *Deener*, 94 U. S. 780,778, as follows:

> "A process is a mode of treatment of certain materials to produce a given result. It is an act, or a series of acts, performed upon the subject matter to be transformed and reduced to a different state or thing. If new and useful, it is just as patentable as is a piece of machinery. In the language of the patent law, it is an art."

At the same time it was pointed out that the terms "process" and "method" were sometimes used in a more general or looser sense as describing merely the function or operation of a machine and that such processes or methods are not patentable.

While Mr. Justice Bradley defined a process which was patentable, as an "act or series of acts" performed upon the subject matter to be transformed and reduced to a different state or thing, he did not define the kind or nature of the act or acts which must be so performed, although he stated that there were some acts the performance of which would not constitute an invention.

In some later decisions, particularly *Risdon Iron and Locomotive Works* vs. *Medart,* 158 U. S. 68, 76, it was intimated, though not decided, that the acts referred to must be those which result in chemical reaction or some elemental change, but manifestly such a limitation could not have been in the mind of Mr. Justice Bradley, or of this Court, when Cochrane *vs.* Deener was decided because the "acts" which constituted the process in the patent involved in that case were not of that kind, but were purely mechanical acts carried out by mechanical means.

It is perfectly evident that an article may be transformed and reduced to a different state or thing by an act, or a series of acts, which are mechanical and do not involve any chemical reaction or elemental change, and that the case of Cochrane *vs.* Deener did not limit patentable processes to acts of the latter kind.

When Mr. Justice Brown's opinion in *Risdon Iron and Locomotive Works* vs. *Medart* was first read, it created the general impression that this Court possibly intended to establish the strict rule and to limit processes which were patentable to those involving chemical reactions or elemental changes, but later decisions of this Court have shown that such was not the intention. In *Westinghouse* vs. *Boyden Power Brake Co.,* 170 U. S. 537 (see particularly 557) such an intention is expressly disclaimed, and in the comparatively recent case of *Carnegie Steel Co.* vs. *Cambria Iron Co.*, 185 U. S. 403, this Court sustained a process patent which clearly did not involve in such acts.

In the case of *Westinghouse* vs. *Boyden Power Brake Co., supra,* alhough the question was really not involved, the Court used language which might tend to create the impression that patentable processes should be limited to such acts, and Mr. Justice Shrias in a dissenting opinion strongly expressed his protest to the adoption of such a rule (170 U. S., p. 574):

> "I cannot assent to what is perhaps rather inti-
> "mated than decided in the opinion of the Court that

> "what is called a 'process' in order to be patentable must "involve chemical or other similar elemental action. "The term 'process' or 'method,' as describing the subject of a patent, is not found in the statutes. No reason is given in the authorities, and I can think of none "in the nature of things, why a process or method may "not be patentable, even though a mechanical device or "a mechanical combination may be necesssary to render the new process practicable."

The inevitable result of these conflicting opinions has been to create doubt and confusion throughout the Federal Courts. Some judges have taken the decision in *Risdon Iron and Locomotive Works* vs. *Medart* as definitive of the question. Judge Seaman in Wisconsin felt compelled in the case of *Travers* vs. *Hammock Co.*, 78 Fed. Rep., 638, to declare the Travers patent for a process of making hammocks invalid on demurrer on the authority of the *Medart* case, although Judge Coxe in New York had previously held it valid after a hearing on the merits (64 Fed. Rep. 771); and Judge Coxe's decision in this latter case is referred to, not with disapproval, in *Westinghouse* vs. *Boyden Power Brake Co.*

On the other hand, other judges have refused to adopt any such interpretation of the *Risdon* case and have sustained patents for processes which consisted solely in mechanical acts or steps, without involving either chemical reaction or elemental changes.

Simonds Rolling Machine Co. vs. *Hathorn Mfg. Co.*, 90 Fed. Rep. 201.

Melvin vs. *Thos. Potter Sons & Co.*, 91 Fed. Rep. 151.

Kahn vs. *Starrells,* 135 Fed. Rep. 532.

R. Thomas & Sons Co. vs. *Electric Porcelain and Mfg. Co.*, 111 Fed. Rep. 923.

Baker Lead Mfg. Co. vs. *National Lead Co.*, 135 Fed. Rep. 546.

Kirchberger vs. *American Acetylene Burner Co.*, 124 Fed. Rep. 764.

American Tube Works vs. *Bridgewater Iron Co.*, 132 Fed. Rep. 16.

Shepard vs. *Excelsior Steel Furnace Co.*, 137 Fed. Rep. 399.

J. R. Williams Co. vs. *Miller DuBrul & Peters Mfg. Co.*, 107 Fed. Rep. 290.

Peters vs. *Union Biscuit Co.*, 120 Fed. Rep. 679.

The Court of Appeals of the District of Columbia, which now has Appellate jurisdiction over the Patent Office on questions of patentability, has twice passed upon the question recently, and has refused to accept any such limitation on the patentability of processes.

In re Weston, 94 O. G. 1786, 17 App. D. C. 431.

In re Wagner, 106 O. G. 1873, 22 App. D. C. 267.

The Weston case is particularly interesting as showing the unsettled and doubtful condition of this question. In this case Justice Morris says:

> "The decision in the case of Risdon Iron & Loco-"motive Works *vs.* Medart seems to have been under-"stood by some Courts and to some extent by the "Patent Office as restricting the patentability of pro-"cesses to those which involved chemical or other ele-"mental action. But that this was an erroneous im-"pression sufficiently appears from the subsequent case "of Westinghouse *vs.* Boyden.
>
> * * * * * * * * *
>
> "and the general subject of patentability of processes, "other than those involving chemical or other elemen-"tal action, is left open to question.
>
> * * * * * * * * *
>
> "Numerous other cases have been cited to us wherein "the Patent Office has issued patents for processes of "a merely mechanical character, as distinguished from "processes of elemental or other similar action, and it "seems to us that, *in the absence of any distinct and "positive utterance from the Supreme Court of the "United States limiting patentability to processes of "the latter character, it is not improper that the prac-"tice should continue."*

The same conclusion was reached by the present Commissioner of Patents, in *ex parte Patterson,* 116 O. G. 2533.

THE RECORDS SHOW THAT DURING THE FIRST TWO MONTHS OF THE PRESENT YEAR THE PATENT OFFICE HAS GRANTED NO LESS THAN SIXTY PATENTS, FOR PROCESSES OTHER THAN THOSE RELATING TO CHEMICAL REACTIONS AND ELEMENTAL CHANGES, ALL OF WHICH ARE INVALID, IF THE APPLICATION OF THE DECISION IN THE RISDON CASE TO THIS PATENT IS SOUND.

In *ex parte Weston, supra,* Justice Morris has divided so called processes or methods into three classes:

(1) Those involving chemical or elemental action, which are clearly patentable.

(2) "Functions of machines" which are not patentable, and:

(3) Those residing in mechanical acts or steps, not the mere functions of a machine, of which the patentability is disputed.

It would seem clear from this review of the decisions not only of this Court, but of the inferior Federal Courts, that the patentability of this third class of methods or processes as "arts" under the statute, is an unsettled and disputed question of the patent law, which can only be determined by this Court.

This question is the one presented by this case.

The invention, if any there be under the statutes, is one which consists in the performance of certain mechanical acts upon a piece of metal, such acts being performed in such relation to one another and to the metal acted upon that they coäct or combine together to produce a result due to their combination, and thereby transform and reduce the metal acted upon to a different state or thing.

It would hardly be possible to find any process consisting of a series of *mechanical* acts which more completely meets the requirements of Mr. Justice Bradley's definition of a patentable process. Not only are there successive acts, but they must be performed in a certain relation to one another and to the material acted upon so that they will combine or coäct, and produce a result by their combined action, and the material acted upon will, by subjection to these acts, be transformed and reduced to an entirely different state or thing. If any process residing in mechanical acts, as distinguished from chemical reactions and elemental changes, is patentable, we submit that this process is.

The Court of Appeals, for the Third Circuit, has held this invention unpatentable on the authority of the Risdon case because "the so-called invention was not really an invention within the meaning of the patent law".

2. THE QUESTION INVOLVES THE UNIFORMITY OF THE PRINCIPLES OF PATENT LAW AS THEY ARE INTERPRETED BY THE COURTS OF DIFFERENT COUNTRIES.

Not only is the question presented by this case one of serious moment, as affecting our own patent laws, but it is one of international importance; it involves not merely a local, or national question, but a fundamental principle of jurisprudence.

It has been the effort, in recent years, to bring about a greater uniformity in the laws of different nations, where they have involved common principles or international interests. Among the most important of the subjects considered has been that of the protection of industrial property. This led to "The International Convention for the Protection of Industrial Property" entered into at Paris, on March 20, 1883, to which this country became a party on May 30th, 1887.

It was one of the objects of this convention to bring about, so far as possible, uniformity in the patent laws.

While the primary object of the Convention was to establish more fully the right of the citizens of one nation to secure protection under the patent and trade-mark laws of other nations, the secondary object was, and the inevitable result has been, to bring about a greater uniformity in those laws.

The differences in the patent laws of the different nations were not, however, differences relating to the nature of the property that was susceptible of protection, but differences in the manner by which that protection might be secured, and in the persons who might secure it.

These differences in the various patent systems often made it difficult for the citizens or subjects of any one country to obtain adequate protection under the laws of other countries, because of the impossibility of simultaneously complying with the conflicting regulations of the different systems.

The "Convention" has to a great extent overcome this, and has brought the various patent systems, including our own, into greater uniformity.

There are, however, still existing great differences between the patent systems of different nations. In Great Britain and the Continental countries an application may be filed and a patent obtained, under certain conditions, by any one who is not the actual inventor, while in this country and in Canada the application must be made by the inventor, or by his executor or administrator, if the inventor is deceased.

These differences, however, relate to the *persons* who may obtain protection, not to the nature of the property which may be protected. As to this there should be no difference.

The fundamental idea upon which the granting of patents is based is the same in all countries. It is that expressed in England by the Court of King's Bench as early as 1615 in

The Clothworkers of Ipswich Case, Godb. 252, 1 Am. and Eng. Pat. Cases 6.

> "The king granted unto B, that none besides him-"self should make ordinances for battery in time of "war; such grant was adjudged void.
>
> "But if a man hath brought in a new invention "and a new trade within the kingdom, in peril of his "life, and consumption of his estate and stock, etc., "or if a man hath made a new discovery of anything, "in such cases the king, of his grace and favor, in "recompense of his costs and travail, may grant by "charter unto him, that he only shall use such a trade "or traffic for a certain time, because at first the people "of the kingdom are ignorant and have not the knowl-"edge or skill to use it, but when that patent is expired, "the king cannot make a new grant thereof, for when "the trade has become common, and others have been "bound apprentices to the same trade, there is no rea-"son why such should be forbidden to use it."

The patent is granted because the patentee has conferred something new and useful to the fund of public industrial knowledge. It must be a new and useful invention or discovery, whether it be the product of the brain of the applicant, as in this country and in Canada, or may have been the invention of another from whom the applicant has obtained the information regarding it, as may be the case in Great Britain and in Germany.

This is the theory upon which the right to a patent is recognized in all countries. The thing for which protection is sought must not merely be new and useful, it must be an invention. And the standard of "invention" is even higher in some other countries than it is here—in Germany for instance, where it is well known that many improvements, which have successfully passed the American Patent Office, are thrown out by the German Office for want of "invention".

And this rule is constantly recognized in the English Courts. Whatever may be the differences in the patent systems of different countries, as to the procedure for protecting the right, or the persons by whom the protection may be secured, the nature of the right which is capable of protection is determined by the same principles.

And if the principles are the same, they should, when applied to similar subjects, result in uniform conclusions.

Differences in the patent systems, as such, are not now serious; under the International Convention they are each year becoming less important; but differences in the application of the common principles governing the very nature of inventions are of most serious importance, and such a difference is directly presented by this case.

The thought that a man may *invent* a new process, art or method, which, although it meets all the tests of invention, novelty and utility, is still not susceptible of protection under the general principles governing the right of protection, is foreign, so far as counsel have been able to learn, to the jurisprudence of other nations.

If it be true that it is the law of this country, under the decision of this Court in *Risdon Iron and Locomotive Works* v. *Medart*, as interpreted by the Court of Appeals in this case, that a new and useful process, the result of an exercise of the inventive faculties, such as the process described in the patent here involved, cannot be the subject of protection by patent, then the law in this country, on the fundamental principles governing the nature of the property susceptible of protection, differs from that of the other great industrial nations.

The fact that a process is composed of steps or operations which are purely mechanical in their nature has never been recognized as a ground of invalidity in the English Courts.

Counsel are not aware of any British authority in support of the contrary, and cannot point to any case, in which it has been sought to differentiate between processes patentable and non patentable in this manner.

The more important dicta in the earlier cases, when the position of processes under the Statute of Monopolies may be said to have been in some doubt, apply to processes generally, and from the language used it is clear that no distinction of the kind now suggested was present in the minds of the Judges. For instance in *Boulton* v. *Bull,* Davies' Pat. Cases 162, Eyre, C. J., says:

> "The patent can only be for the mechanism, if "new mechanism is used, or for the process, if it be "a new method of operating, with or without old "*mechanism* by which the effect is produced."

Lord Tenterden in *The King* v. *Wheeler,* 3 Barn. & Ald. 350, refers to a patentable process as:

> "Carried out by known *implements* or elements "acting upon known substances and ultimately produc-"ing some other known substance, but producing it in "a cheaper or more expeditious manner, or of a better "and more useful kind."

As instances of processes which resided in purely mechanical steps which have been upheld by the English Courts attention is directed to the following:

Hartley's patent for a method of securing buildings against fire by applying plates of metal (see the judgment of Eyre, C. J., in *Boulton & Watt* vs. *Bull,* 2 H. Bl. 493);

Jones vs. *Pearce,* 1 Webster Patent Cases, see p. 123, where Patterson, *J.*, upheld the patent on the ground that "the claim was for the invention of a method of making wheels on the principle of suspension";

In *Russell* vs. *Cowley,* 1. Web. Pat. Cases 459, the patent covered a method of welding tubes by drawing them through a die. (In this process a welding temperature is employed, but the invented process is purely mechanical);

In *Walton* vs. *Potter* 1 Web. Pat. Cases 585, and *Gibson* vs. *Brand*, 1 Web. Pat. Cases 627, are purely mechanical processes for making fabrics.

In *Reynolds* vs. *Amos,* 3 Pat. Off. Rep 215, the patentee claimed the use of chains for obtaining pressure in the making of ensilage;

In *Dowling* vs. *Billington*, 7 Pat. Off. Rep. 191, the patent was for a purely mechanical method of weaving wire. In this case Chatterton, V. C., said, p. 199:

> "The machine is common to all and the whole "question is as to the method on which the product of "the machine is used. I see no ground in law for refusing a patent to a man for using a machine in a "particular way so as to produce a different product";

In *Tubes, Limited* vs. *Perfecta Seamless Steel Co., Ltd.*, 20 Pat. Off. Rep. 77, a patent was sustained for the mechanical method of compressing and drawing metal tubes;

Gammons vs. *Battersby*, 21 Pat. Off. Rep. 322, and *Boulton* vs. *Adjustable Cover and Boiler Block Co.*, 22 Pat. Off. Rep. 593, are other instances of processes of this kind.

We are advised that in Germany and France also the courts have taken the same view of the patentability of such processes. Counsel regret that they are not at present able to cite the decisions of the French and German courts on the point, but expect to be able to do so on the argument of this case, if this Court shall see fit to grant the writ.

If such is the law in the three principal manufacturing countries, other than the United States, it follows, that, if processes which do not involve chemical reactions or elemental changes are not patentable in this country under the decision of this Court in Risdon Iron and Locomotive Works *vs.* Medart, as that decision has been interpreted and applied to the patent in this case, there is a direct conflict between the laws of the principal nations on this fundamental question of the nature of the property that is susceptible of protection. We believe that it is in the interest of bringing about that uniformity in the laws for the protection of industrial property which the International Convention was designed to accomplish that this question should be considered and determined by this Court.

3. THE ONLY STANDARD OF PATENTABILITY SHOULD BE THAT THE IMPROVEMENT, WHETHER IT BE AN ART, MACHINE, MANUFACTURE OR COMPOSITION OF MATTER, SHALL BE NEW AND USEFUL, AND THE RESULT OF AN EXERCISE OF THE INVENTIVE FACULTIES. TO HOLD OTHERWISE IN THE MATTER OF PROCESSES IS TO ESTABLISH A PROSCRIBED CLASS OF INVENTORS.

Following the principles established in England under the Statute of Monopolies, the Constitution empowered Congress "to promote the progress of science and useful arts by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries."

In pursuance thereof Congress has passed an Act under which:

> "any person who has invented or discovered any "new and useful art, machine, manufacture or composition of matter, or any new and useful improvement thereof"

may, under certain conditions, and upon complying with certain regulations, secure a patent in accordance with the Constitutional provision.

The Constitution placed no restriction or limitation upon Congress as to the nature or character of the invention or discovery, which might be the subject of protection, and the presumption is, that Congress, in the Act quoted, intended to fully put into effect its constitutional authority; and, in defining an invention or improvement which might be protected by patent, as an "art, machine, manufacture or composition of matter," intended to comprehend all real inventions, rather than to exclude or eliminate any particular class from the benefits of the Act.

The standard, by which is measured the patentability of inventions or improvements relating to "machines, manufactures and compositions of matter," is that they shall be new, useful and the result of the inventive faculties, as distinguished from the merely imitative faculties; and counsel cannot understand the logical basis for adopting a different standard regarding the remaining class of inventions or improvements referred to in the act, *i. e.* those relating to arts or processes. If the processes are new, useful and the result of the inventive faculties, as distinguished from the merely imitative faculties, they should be entitled to protection just as much as are the other classes of inventions, and we submit that to hold otherwise is illogical and unjust.

The patentability of arts or processes under the Statute of Monopolies was seriously questioned and debated, but finally recognized and established in England, and there can be no doubt that Congress has extended the protection of the patent laws to this class of inventions, as they are expressly included in the acts. If such is the case, the patentability of such inventions should not be measured by other standards than those which apply to other classes of inventions.

An "art," as the term is used in patent law, may be defined (Cent. Dic. Tit. "Art," 4) as: "A system or rules and traditional methods for facilitating the performance of certain actions," as *e. g.*, the art of weaving, dyeing, printing and the like. More specifically, it may be defined as an act or a series of acts performed upon an article to transform or change it to a different state or things (Cochrane *vs.* Deener, 94 U. S. 288). Very few if any arts can be practiced without the use of instrumentalities or machines, but the "art" relates not to the instrumentalities but to the steps or acts performed, albeit they cannot be performed without such instrumentalities.

> "While an art cannot be practiced except by means of physical agents through which the force is brought in contact with or is directed toward its object, the existence of the art is not dependent on any of the special instruments employed. It is a legal, practical invention in itself. Its essence remains unchanged, whatever variation takes place in its instruments, as long as the acts of which it is composed are properly performed."
>
> *Robinson on Patents*, Sec. 167, Vol. I, p. 250.

The idea that an "art" to be patentable under the Acts of Congress must involve some chemical reaction or elemental change, and cannot reside in a series of steps purely mechanical, is purely fanciful; and results in the establishment of an illogical and false standard of patentability.

This theory apparently had its origin in the dictum of Mr. Justice Bradley in Cochrane *vs.* Deener that the "mere function of a machine" was not patentable as an art. As a general proposition we do not deny this rule, but we do deny the false differentiation of processes which has been built upon it. It is clear from the examples cited that Mr. Justice Bradley did not mean that arts ceased to be patentable arts because machines or mechanical instruments might be used for carrying them out. Nothing could have been further from his mind, because the particular patent under consideration in that case, the validity of which was sustained, was one to a process which did depend upon the use of machines and mechanical instruments and did not involve any chemical reaction or elemental change. What he meant was that, while a machine might be new and patentable, its functions might be old. There might be a new machine for performing an old process, such as planing wood, which is one of the examples he cited, and it was clear that a patent could not be granted for the mere function of such a machine. The reason of this is not because the planing of wood is not an art, but because such mere functions of a machine are not new, or their discovery did not involve an exercise of the inventive faculties. The invention was involved in the production of the machine not in its function. But if a man discovers a new method in the art of planing wood (supposing such a thing to be possible in this stage of the art of woodworking), by which there is something new and useful in the acts performed and the results obtained, and these acts, although necessarily performed by some instruments, might be performed by various other instruments or machines, such acts would not be the "*mere* functions of a machine," but would constitute an improvement in the art of planing wood, and, if the result of an exercise of the inventive faculties, would constitute an "invention" within the Statutes, just as much entitled to protection, as a new machine, manufacture or composition of matter. It was undoubtedly this thought that was in the mind of Vice Chancellor Chatterton when he said in Dowling *v.* Billington, 7 Pat. Off. Rep. 191, *supra:* "I see no ground "in law for refusing a patent to a man for using a machine "*in a particular way*, so as to produce a different product. "The invention resides not in the mere function of the ma"chine, but in its use *in a particular way.*"

The mistake has apparently been in taking this reference to the "function of a machine" in *Cochrane* v. *Deener* and other cases, as applying to mechanical appliances generally, and thereby creating a new and special standard of patentability for that class of inventions known as "arts."

There can be no doubt that many methods have been devised for transforming or reducing an article to a different state or thing by a series of steps performed upon it, where the steps are purely mechanical, and yet have involved an exercise of the inventive faculties in the very highest degree. There is no reason in the nature of things why the inventors of such methods shoud not receive the protection of the patent laws.

There is hardly a reported case, either in this Court or in the inferior Federal Courts, where this question has arisen, and in which the patent has been declared invalid, where the true ground of the decision has not been lack of an exercise of the inventive faculties. Such was certainly the case in *Risdon Iron and Locomotive Works* v. *Medart.* Here the patent related to the boring, shaping and fitting of parts together to make a pulley; and the patent was clearly void as a process, because there was nothing new in any of the steps performed or in their combination. The alleged process consisted simply in a series of old separate steps which may have produced an improved pulley, but did not constitute an improved method of construction involving any exercise of inventive faculties.

We feel that it has been a recognition of this inconsistency in the treatment of patents for processes that has deterred this Court from making any definite decision of the question. Unfortunately, however, the Court has repeatedly used expressions which have indicated a leaning in the manner suggested, and this has justified the Court of Appeals in this case in declaring this most meritorious and valuable patent invalid on the authority of the Risdon case.

4. THE QUESTION IS DIRECTLY PRESENTED BY THE PATENT IN THIS CASE, AND POSSIBLY NO BETTER PATENT COULD BE SELECTED FOR THE PURPOSE OF SUBMITTING IT.

The novelty and utility of the complainant's process was not seriously attacked either in the Circuit Court or in the Court of Appeals. The evidence in support of novelty and utility is overwhelming (see pp. 36-39 *post*). Infringement of the process was substantially admitted by defendant's expert (see Rec., p. 231). The only serious attack was made upon the validity of the patent on the ground that it did not constitute a patentable process under the decision of this Court in the *Risdon* case because it was for a series of mechanical steps and did not involve any chemical reaction or elemental change.

The patent was sustained by the Circuit Court against this defense on the authority of *Cochrane* v. *Deener*, 94 U. S., and *Tilghman* v. *Proctor*, 102 U. S. 707.

The Court of Appeals expressly bases its opinion on the authority of the *Risdon* case, on the ground "that the so-called invention was not really an invention at all within the meaning of the patent laws."

It is true that the Court also suggests that the patent is for a principle and that the invention is insufficiently described, but we think that it will become apparent, when the nature of the invention and the patent are considered, that those objections are untenable, and that the only serious question involved was that of the patentability of the process, as such, under the decision of this Court in the *Risdon* case. It is expressly on that case that the decision of the Court of Appeals is based.

The patent relates to an improvement in the "art of expanding sheet metal":

The term "expanded metal," which is now well known throughout the world, originated with the complainant's patentee Golding and his associates to designate the metal, and most happily describes it. It is metal which has been converted into a unitary reticulated or open meshed sheet by expanding a sheet of metal into a greater area than the original blank. Open or reticulated sheets had previously existed, such as wire mesh formed of intertwined wires or rods, but that was not "expanded metal" because it was not a unitary sheet and was not formed by the expansion or enlargement of a blank; sheet metal had been cut and stamped up in various forms (See Elkins and Ohl patents, Rec. pp. 276, 284), but that was not "expanded metal," because the original sheet was not enlarged or expanded in area; it remained of the same length and breadth, it had been changed in superficies only.

The term "expanded metal" refers only to that kind of metal which has been expanded in area; *i. e.* in length or breadth, or both, by cutting and opening it into a reticulated form.

It is not believed necessary at this time to go into an extensive examination of the prior art.

The first effort to make expanded metal is illustrated in Golding's 1884 patent (Rec. 98), Golding's 1885 patent (Rec. 102), Long's 1862 British patent (Rec. 287), and Johnson's British patent (Rec. 292). This consisted of two separate and distinct steps. The sheet was first cut with rows of alternately arranged slits and was then pulled out to expand the cuts. This method was commercially impractical and was never used.

The second effort is that described in Golding & Durkees' 1885 patent 320,242 (Rec. 120). By this method the metal was simultaneously cut and bent on diagonal lines. It involved a very ingenious and complicated method, and by it expanded metal was first produced successfully and became a commercial article. The method involved, however, several very serious defects; the product was more or less imperfect and unsatisfactory.

The third method is that of the patent involved in this case. As defined in the claim of the patent (Rec. p. 95) the method is as follows:

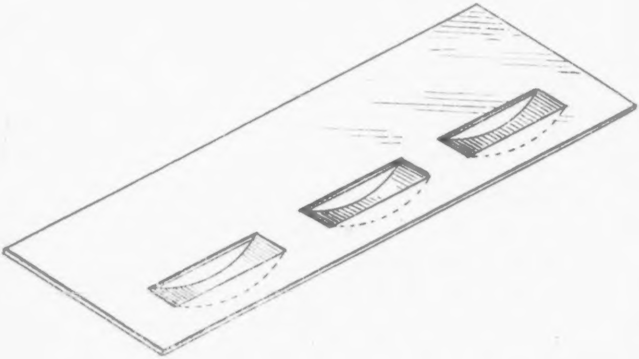
> "The herein described method of making open or "reticulated metal work, which consists in simultaneously slitting and bending portions of a plate or sheet "of metal in such manner as to stretch or elongate the "bars connecting the slit portions and body of the sheet "or plate, and then similarly slitting and bending in "places alternate to the first mentioned portions, thus "producing the finished expanded sheet metal of the "same length as that of the original sheet or plate, sub"stantially as described."

The process here described—and it is to be noted that the words of the claim are those suggested by the Patent Office Examiner for the purpose of defining the invention—consists essentially of two acts: simultaneously cutting, bending and stretching metal strands, and *then again* simultaneously cutting, bending and stretching other strands, the two acts being performed in such relation to one another and to the metal acted upon that they co-act to produce a result due to their peculiar combination.

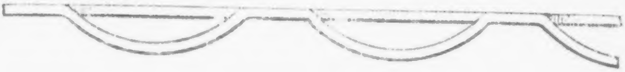
The act of simultaneously cutting, bending and stretching metal strands does not produce expanded metal, nor does the repetition of that act produce such metal. It is only when the two acts are so performed with relation to one another and to the metal acted upon that their separate results coalesce, as it were, and combine together to produce a unitary result.

The act of simultaneously cutting, bending and stretching metal strands in a sheet of metal results in the formation of bent strands extending below the plane of the sheet and leaving openings in the body.

This is illustrated in the following view:

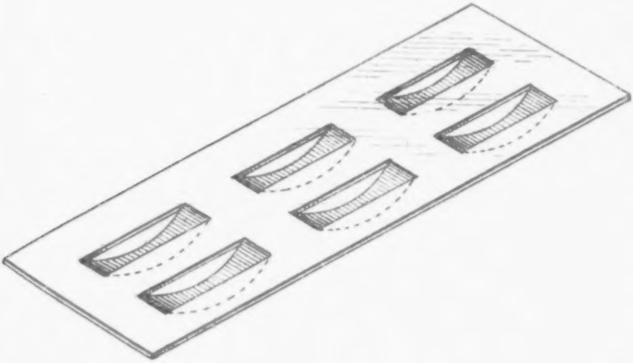


And the result is the same, or substantially so, whether such strands be cut, bent and stretched in the body of the sheet, as in the above view, or at the edge as shown below.

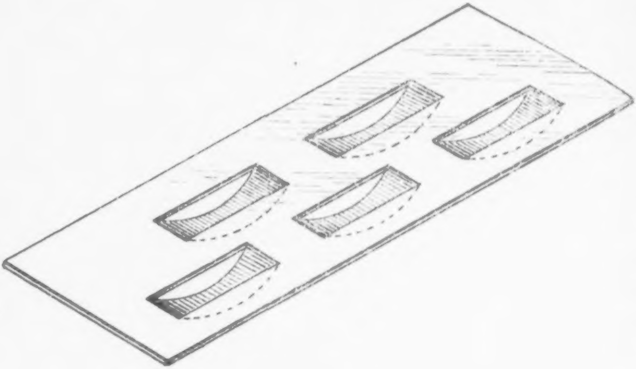


Manifestly this step of simultaneously cutting, bending and stretching strands does not produce expanded metal. It merely results in punching down stretched *loops*, or half diamonds, if the loops are angular in form.

Nor will the mere repetition of this act produce expanded metal. We will then have merely a series of such rows of such loops. This is illustrated in the following view:



And it does not matter whether the strands in succeeding rows are cut, bent and stretched in line with one another, as in the above view, or in alternate positions, as in the following view:



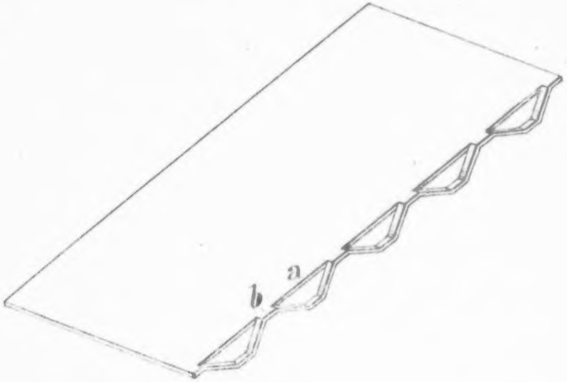
It follows, therefore, that the mere act of simultaneously cutting, bending and stretching metal strands does not produce expanded metal, nor the mere repetition of that act, nor the mere alternation of the positions of the strands in successive rows.

Why is it, then, that the performance of these operations does not result in expanding the metal? *It is simply because there is no co-operation between the successive steps.* Each step of cutting, bending and stretching a row of strands is independent of the others, it does not affect or qualify any of the others, it does not co-act with the other steps to produce a result due to combined action.

Here we have a series of separate independent operations each complete in itself.

To produce expanded metal something more is necessary. The successive steps of cutting, bending and stretching the strands must be performed in such relation to one another and to the metal acted upon that they will co-act, and that the result produced will not be a series of independent results, each due to the performance of a single act, but a different result due wholly to the combined results of successive acts.

The first step of simultaneously cutting, bending and stretching strands, in the production of expanded metal, does not differ in its result from any of the separate steps above referred to. It merely produces stretched loops or half diamonds struck down from the plane of the sheet thus:



The metal is not yet expanded. There is merely formed a row of loops or half diamonds.

Expanded metal is made up of open meshes bounded on all sides by strands. This first step produces but a half-mesh, bounded by strands on one side only. To produce the complete mesh the second step must be performed, but it must be so performed that it will produce the intended result. The mere repetition of the operation will not produce the result. It is necessary that the second act of cutting, bending and stretching shall be performed *at the uncut edge of the metal and in a position alternate to the performance* of the first act. This is described in the patent in ll. 34-47 (Rec. 95):

> "In the practice of my invention I prefer to make "a series of slits in a straight line *across the edge of* "*the sheet*, and at the time of cutting the slits and as "a continuation of that operation to depress or stretch "the several metal, *i. e., those porions of the sheet lying* "*outside of the cuts*, in a direction at right angles to the "sheet, without any contraction from the length of the

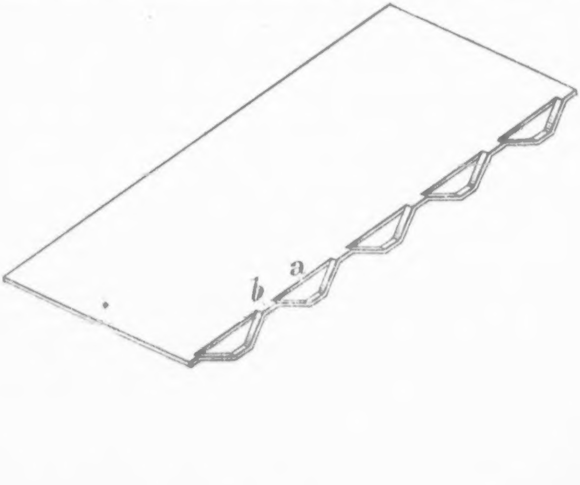
"original sheet. *This operation is then repeated after "the sheet has been fed forward,* the slits being made "opposite the portions unsevered at the previous opera- "tion, and so on until the entire sheet is expanded."

And in lines 90-98

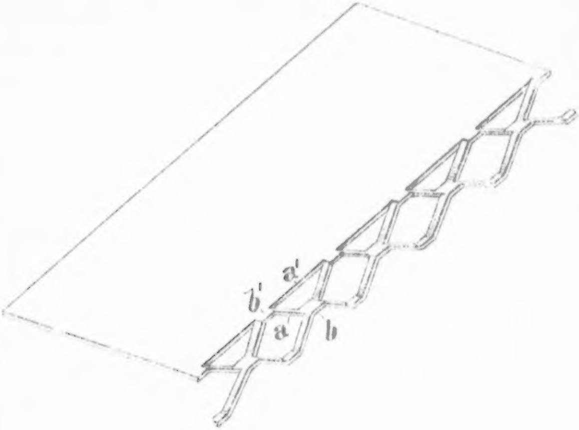
"One line of slits across the sheet is formed at "each operation, and the upper cutters, or the sheet, "may be shifted and the sheet be fed forward between "the operations so that the slits are in every *case made "back of the portions left unsevered at the preceding "operation,* or in other words, the slits and unsevered "portions alternate in position at successive operations."

To make expanded metal, the first step is performed at the edge of the sheet to depress and stretch those portions lying outside of the cuts, *i. e.,* the strands, and the second step must be similarly performed *at the new edge* thus created to similarly depress and stretch those portions of metal lying outside of the new cut or line of cuts, *i. e.* the second strands, and it must be performed at a point alternate to the first step, so that the slits in every case will be made back of the portions left unsevered at the previous operation.

We have seen that the first step merely cut, bent and stretched the strands, forming the loop or half mesh, or row of loops or half meshes, at the edge of the sheet, thus:

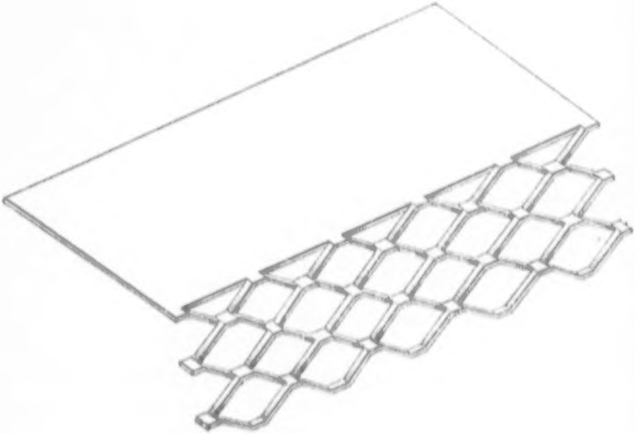


The second step is performed at the new edge *a* and the metal is similarly cut, bent and stretched, but the slits are made at the points *b* "*back of the portions left unsevered at the preceding operation,*" with the result that, as the new loops or half meshes are thus formed, the metal at the tops (*b*) of the previously formed loops is severed *and pushed down* as shown in the following view:



This cutting away and pushing down of the metal at the points *b* resulting from the second operation, thus caused the first loop to be moved away from the body of the sheet and a new edge a^1 is formed, upon which the next step is performed as before at points alternate to the last. The second operation is exactly similar to the first operation so far as concerns the cutting, bending and stretching, but, by reason of the fact that it is performed at the edge of the metal and back of the portions left unsevered at the preceding operation, it not only cuts away and pushes down the upper portions or angles (b) of the first loops or half meshes, but by the creation of a second set of loops or strands furnishes the strands necessary to make the completed mesh. Thus, the metal is "expanded," and the expansion is produced, not by either operation of cutting, bending and stretching the strands alone, but by the co-action of the two in the particular manner described. These two operations, performed in any other relation to one another and to the sheet acted upon would not produce expanded metal.

The third step, performed again in the same relation to the second step, that is *along the edge* and "*back of the portions left unsevered at the preceding operation,*" will push down the points b^1 and expand the metal still further, as shown in the following view:



There was certainly nothing like this known in the prior art of making expanded sheet metal, nor anything to suggest it. It is true that it was known that metal could be simultaneously cut, bent and stretched, but it was not known that the repetition of that act at the edge of the metal in places back of the portions left unsevered at the previous operations would result in the production of expanded metal. It is necessary to secure the result that the cuts, together with the bending and stretching, shall be made *at the edge of the metal* and that each succeeding cut (together with the bending and stretching) shall be made back of the portions left unsevered at the previous operation. Without this the result cannot be obtained.

This is the discovery that Golding made and that he describes in his patent. It constitutes a new method of expanding metal differing materially from the methods previously known and practiced. IT CONSISTS IN THE PERFORMANCE OF CERTAIN OPERATIONS SUCCESSIVELY IN A CERTAIN RELATION TO EACH PREVIOUS OPERATION AND TO THE MATERIAL, BY WHICH THE SUCCESSIVE STEPS, WHEN SO PERFORMED, CO-ACT OR COMBINE TOGETHER IN THE PRODUCTION OF A NEW RESULT.

Golding did not invent or first suggest the separate operations. The operation of simultaneously cutting and bending metal so as to stretch the strand was old. What Golding discovered or invented was the method of repeating that old operation *in such a way that the two operations would combine to produce a new result by reason of their combination.*

Admitting that the operations are purely mechanical, in the sense that they require mechanical instruments for carrying them out, why should this affect the patentability of the process? The invention was not in the operations themselves, considered separately, nor in the mechanical instruments for performing them, but in the particular manner in which they are applied to the subject matter—the metal blank—whereby they combine to produce the result of transforming the blank into a different state or thing—a sheet of expanded metal.

If this manner of applying these operations was new and useful, and its discovery was the result of an exercise of the inventive faculties, the invention or discovery is just as much entitled to protection as is a process consisting in applying known chemicals in a certain order to an article—such as a pelt—for the purpose of treating it in the art of leather making.

The invention did not exist in any particular machine. The evidence shows that the invention of the process preceded the invention of an organized machine by nearly a year. It is true that several machines have been devised for carrying out the process commercially. It would not be difficult for any skilled machine builder, without the exercise of any inventive faculties, to design machines for the purpose of using the process, after the process was known. The patentee described in his patent in a general way the instrumentalities that may be used, but he does not attempt to describe a complete organized machine, because his invention existed, not in such a machine, but in the method. Such an invention could not be protected by a patent on the machine. Various machines radically different in kind could be and have been designed for using the process. The discovery of the process was the work of the inventor; the designing of the machine, the work of the mechanic.

Nor could the discovery be protected by a patent on the product. Expanded metal had been made before. As an article, it was not new. True, the metal made by the new process is vastly better, but it was not radically new in kind. A new process of tanning is patentable, not because it produces new leather, but because it produces leather better, more quickly or more economically. The superiority of expanded metal made by the new process is very great, but the invention did not exist in the improved metal, but in the improved method of production, whereby it was made better and more economically.

If Mr. Golding's invention or discovery in the art of making expanded metal could not be protected by a patent on a machine or on the article, and a patent for the method or process cannot be sustained, Mr. Golding, as well as a large class of most meritorious inventors, is without protection under the patent laws. Surely such a result was not the intent of Congress.

It is true that there is a suggestion in the opinion of the

Court of Appeals that the patent is for a principle or "happy thought" on the part of the patentee, Golding, and as such would not be patentable under the decisions of this Court in *Burr* v. *Duryee*, 1 Wall. 532, and *O'Reilly* v. *Morse*, 15 How. 62. That there is no sound basis for such a suggestion is, we think, apparent from the preceding explanation of the invention. The Court of Appeals seems to have looked upon the single, isolated operation of simultaneously slitting, bending and stretching strands as the subject of the invention. Nothing could be further from the fact. That operation was old; it was used in the manufacture of metal lathing; it was shown, for example, in the Ohl patent (Rec. 284), which was cited by the Patent Office during the prosecution of Golding's application.

Had Golding's supposed invention existed in this, it would not have been a "happy thought"; it would have been nothing new. The mere operation of simultaneously slitting, bending and stretching sheet metal, as we have endeavored to show, was old. The invention did not exist in any such operation, but in the combination of a *series of such operations* in such a manner that they co-act to produce a new result. The patentee does not claim the right to those operations or to a series of those operations, but to the combination of those operations *in a particular way*.

This was the distinction recognized by the Patent Office. It was understood that the single operation of simultaneously slitting, bending and stretching metal strands was old, and the claim of the patent was suggested by the Examiner for the very purpose of pointing out the difference, *i. e.*, that the invention did not exist in the single operaton, but in the combination of a series of such operations in a particular way whereby they combined to produce the new result.

It is this combination of the operations in the particular way that constitutes the method or process, and we submit that to such an invention the principles of O'Reilly *v.* Morse have no relevancy whatever.

Perhaps no better statement of the difference between a "principle" and a patentable process can be found than that of Lord Chief Justice Eyre in *Boulton & Watt* v. *Bull*, 2 H. Bl. 463, p. 496:

> "Undoubtedly there can be no patent for a mere "principle, but for a principle so far embodied and "connected with corporal substances as to be in a con- "dition to act to produce effects in any art, trade, indus- "try or manual occupation, I think there may be a "patent. Now this is in my judgment the thing for "which the patent stated in the case was granted, and "this is what the specification describes, though it mis- "calls it a principle. It is not that the patentee has "conceived an abstract notion that the consumption of "steam in fire engines may be lessened, but he has "discovered a practical manner of doing it; and for that "practical manner of doing it he has taken this patent. "Surely this is a very different thing from taking a "patent for a principle. It is not for a principle, but "for a process."

There would seem to have been some confusion in the mind of the Court of Appeals between the patentability of processes involving mechanical steps only and principles, but if the decision of the Court was based upon the supposition that the Golding process of making expanded metal was for a principle, it was such a manifest misapplication of the principles of the case of O'Reilly *v.* Morse, that we think the Court on that ground also should grant the writ and review the case.

Nor is there any merit in the suggestion that the patentee has not adequately disclosed his invention. No such question was raised by the defendants. There is no attempt to describe an organized machine; but the patente had not invented a machine. His invention was a process, a series of operations or steps to be performed in a particular way upon the subject matter for the purpose of transforming it from a solid blank to a sheet of expanded metal. It is sufficient if he has described the performance of those operations in a manner sufficient to enable those skilled in the art to understand the method in which they are to be performed.

The patent laws require that a patentee shall explain his invention in a manner sufficiently clear to enable those skilled in the art to understand it. If the invention is a machine, then the machine must be described sufficiently to enable those skilled in the art to build and operate the machine: if the invention is a process, consisting, as a process must, merely in the performance of certain operation upon an article or substance, independently of the particular instruments employed, then the patentee must describe the performance of those operations sufficiently to enable those skilled in the art to practice the process, leaving to them the choice of the instruments used for the purpose.

If then, Golding's invention existed in a method of treating metal in a certain way; in the performance of certain operations upon it, it is sufficient if he described those operations and the manner in which they were to be performed. It was unnecessary (and in fact would have been improper) for him to have described an organized machine for the purpose.

His description and illustrations are prepared for the skilled expert in the art, not for the unskilled. The Government employs trained experts to pass upon this question. men charged with the duty of refusing to grant patents which are insufficiently explained. Golding's explanation was sufficient for the Government's expert, and it has proved sufficient to others skilled in the art—amply suffiicient to enable infringers to understand and practice the invention by instruments or machines of their own devising.

It is true that the Federal judiciary are charged with the duty of *deciding* this question, but the Federal Judges are not experts in the mechanical arts. An invention is not insufficiently described because the description is not sufficient for them. The sufficiency of the description has been approved by the Government's expert before the patent was granted, and there should be some evidence before the Court to justify a contrary finding. It is not for the Court to decide as to the sufficiency of the description, but as to the sufficiency of the evidence of sufficiency. The law requires only that the patentee shall so describe his invention as to enable those skilled in the art to understand it; the grant of the patent by the Government's expert raises a strong presumption that he has done so, and there should be competent expert evidence to justify the Court in finding to contrary.

We do not, however, consider these questions material. They are not the basis of the decision of the Court of Appeals. That decision is based upon the *Risdon* case on the theory that under that decision processes such as that described in this patent are not patentable under the statutes.

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5. THE EVIDENCE SHOWS THAT GOLDING'S IMPROVED METHOD WAS NEW AND USEFUL AND A RESULT OF THE INVENTIVE FACULTIES.

This is shown:

(a) By the fact that, although expanded metal was known as an article, the methods or processes employed in its production remained for many years in a very imperfect and unsatisfactory state, and although many persons skilled in the art, including the patentee Golding, had been working for over twenty years on the art, the manufacture of expanded metal did not become a substantial commercial success until the invention of the new process of producing it, which is described in the patent in suit. This condition existed not only in this country, but also in England and Germany, in both of which countries the new method has since displaced the old.

"Expanded metal" as a commercial or practical article capable of use in the industrial arts was originated and created by the complainant's patentee Golding and one George B. Durkee, under the process described in letters patent 320,242, dated June 16, 1885 (Comp. Exh. No. 4, Rec. 120), and the name of "expanded metal" was then first given to it.

The metal expanded by this process, while commercially successful to some extent, was of a character which seriously limited and restricted its uses and adaptability, by reason of the inherent characteristics due to the method of manufacture.

These defects were well known and recognized, both in this country and abroad, and were so serious that they prevented the companies engaged in the business from attaining financial success. This condition existed for a period of about ten years, without any improvement being accomplished.

There is here the first evidence of invention: the long existing demand and the recognized need for improvement, and the failure to attain it by others, or by Golding himself, prior to the discovery described in the patent in suit.

(b) By the fact, that the improvement described in the patent overcame all of the difficulties which had resulted from the prior methods, and which had prevented substantial commercial success both in this country and abroad.

Under Golding's prior method of production there were the following defects: The metal was, (a) limited in thickness and strength; (b) materially shortened in length, to an extent equal to fifteen to twenty per cent.; (c) lacking in strength, beyond its limitation in thickness, because the meshes could not be made at right angles to one another, which is necessary to afford the greatest strength; (d) of unequal strength throughout, because of the impossibility of forming the strands of even width; (e) irregular in form.

While expanded metal made by these processes could be and was extensively used as metallic lathing to hold plaster in walls and partitions, for screens where symmetry was not essential, and as a tension member embedded in concrete arches and floors for short spans, where material strength was not required, it could not be used for office screens and partitions, skylights and window screens, metallic locker walls, and the like, where symmetry is essential and proper fitting to metallic frames is required, or in concrete arches and floors of substantial span, where strength is essential.

The method described in the patent in suit constituted a radical departure from the former method; the deficiencies and limitations of expanded metal were entirely removed, and the character of such metal was so greatly improved that its adaptability and availability for commercil uses was greatly extended.

The sheet is not shortened; instead of a loss of from fifteen to twenty per cent. in the length, the finished sheet is the same length as the original blank; much thicker and heavier metal may be used; the meshes, *i. e.*, openings formed by the expansion, are all square with one another, so that the metal is not only regular in form and appearance, but has the maximum possible strength afforded by the thickness of metal and size of the meshes; the strands are perfectly uniform and straight; the metal forming the strands is stretched or elongated, whereby it undergoes a molecular change and its tensile strength is very materially increased; the meshes are perfectly square with one another, so that the sheets may be fitted to metal frames.

By this new method, not only is a larger and more perfectly formed sheet produced from heavier and stronger metal, but by reason of the molecular change caused in the metal under the process, its tensile strength is increased to a material extent whereby its commercial value is greatly enhanced.

These advantages are reviewed by Mr. Golding on pages 13 and 33 to 36 of the record.

We have here the second evidence of "invention"; the substantial utility of the improvement in overcoming the defects of prior methods.

(c) By the commercial success of the new method. Prior to the invention of the new process, the art had not attained substantial commercial success, either here, or abroad, where it had been introduced by Mr. Golding under the earlier process. After the adoption of the new process, the art immediately became commercially successful, and is now practiced in Great Britain, France, Germany, Belgium, Austria, Spain, Russia, and Canada. The British Company supplies the market in Africa, India, Egypt, South America and Australia. The use of the old process has been practically abandoned. There is now produced in this country, by the new process, approximately twenty thousand tons annually.

We have here the third evidence of "invention"; the fact that the improvement has practically superseded the old methods, and has revolutionized the art and made it one of the most important industries in metal working both here and abroad.

6. THE QUESTION IS ONE OF THE VERY GREATEST IMPORTANCE AND IT IS TO THE PUBLIC INTEREST THAT IT SHOULD BE DECIDED.

Under the unsettled condition of the law on this question there is serious doubt as to the validity of a very large and important class of patents.

The Patent Office, under the authority of the Court of Appeals of the District of Columbia in *ex parte* Weston, 94

O. G. 1786, 17 App. D. C. 431, and *ex parte* Wagner,, 105 O. G. 1873, 22 App. D. C. 267, is granting every week patents for processes of the kind involved in this case (see p. 10, *ante*). Many industries are being built up on the faith of the validity of such patents. If they are not valid, the Patent Office should cease to issue them. It is unjust to inventors and investors that the question should remain in doubt.

The decision in this case, if allowed to stand, will have the effect, not only of overthrowing the great industrial enterprise which has been built up in this country on the faith of this particular patent, but will affect other industries depending upon patents of a similar kind by raising serious doubt as to the protection afforded to them by the patent laws of the country.

If it is the law that such patents are invalid, it is to the public interest that it should be known, and that the injustice of the granting of such patents should cease.

The question must be decided ultimately, and it can be finally decided only by this Court. We believe that the present case presents it as fairly as it ever can be presented

ERNEST HOWARD HUNTER,
of Counsel for the Petitioners.

TRANSCRIPT OF RECORD.

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1908.

No. 606.

THE GENERAL FIREPROOFING COMPANY, PETITIONER,

vs.

THE EXPANDED METAL COMPANY.

ON WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT
OF APPEALS FOR THE SIXTH CIRCUIT.

PETITION FOR CERTIORARI FILED NOVEMBER 7, 1908.
CERTIORARI AND RETURN FILED NOVEMBER [illegible], 1908.

(21,402.)

(21,402.)

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No. 1783.

United States Circuit Court of Appeals, Sixth Circuit.

THE EXPANDED METAL COMPANY, Appellant,
vs.
THE GENERAL FIREPROOFING COMPANY, Appellee.

Appeal from the Circuit Court of the United States for the Northern District of Ohio.

Record.

Original Transcript Filed December 27, 1907.

1 ### *Bill.*

In the Circuit Court of the United States for the Northern District of Ohio, Eastern Division. In Equity.

THE EXPANDED METAL CO.
vs.
THE GENERAL FIREPROOFING COMPANY.

To the Honorable, the Judges of the Circuit Court of the United States in and for the Eastern Division of the Northern District of Ohio:

The Expanded Metal Co., a corporation, created and existing under and by virtue of the laws of the State of Missouri, a citizen of said state, and of the United States, complainant, brings this its bill of complaint against the General Fireproofing Company, a corporation, organized and established under the laws of the State of Ohio, doing business at and having its principal place of business in Youngstown in said state, and a citizen of said state, and an inhabitant of said Eastern Division, defendant.

And thereupon your orator complains and says:

1st. That on or prior to the 7th day of May, A. D. 1894, John F. Golding of Chicago, Illinois, was a citizen of the United States, and became and was the original and first inventor of certain
2 new and useful improvements in Method of making Expanded Sheet Metal which had not been known or used by others in this country, nor patented or described in any printed publication in this or any foreign country before his invention thereof, and which had not been in public use or on sale for more than two years prior to his application for the patent next hereinafter mentioned, and which had not been abandoned or proved to have been abandoned, and upon which no application for a foreign patent was filed more than twelve months prior to the filing of the application in this country; and being such original and first inven-

tor, the said John F. Golding, on the 7th day of May, A. D. 1894, made application in due form of law to the Commissioner of Patents of the United States for Letters Patent upon said invention and duly swore to the specification thereof. That by virtue of an instrument in writing, bearing date the 2nd day of May, A. D. 1894, duly executed and delivered, and duly recorded in Liber F. 49, page 445 of Transfers of Patents in the Patent Office of the United States, the said John F. Golding sold and assigned unto your orator, its successors, assigns and legal representatives, the said invention, and authorized the Commissioner of Patents to issue Letters Patent thereon to your orator as the assignee of the entire interest therein.

That subsequently, after due proceedings in all respects according to the requirements of the statutes in such case made and provided, Letters Patent of the United States, numbered 527,242, dated the 9th day of October, A. D. 1894, signed by the Secretary of the Interior and countersigned by the Commissioner of Patents, were issued under the seal of the Patent Office and delivered unto your orator, whereby was granted to your orator, its successors and assigns, for the term of seventeen years from the said last mentioned date, the
exclusive right to make, use and vend the said invention
3 throughout the United States and the territories thereof, as
will more fully appear by said patent, or a copy of the same duly certified from the records of the United States Patent Office, and in this court to be produced. A printed copy of the specification and drawings of said patent is hereto attached as "Exhibit A."

2nd. That your orator and its licensees have heretofore exclusively exercised and enjoyed the rights and franchises granted by said patent, and ever since the grant of the said patent your orator has been and still is entitled to the exclusive possession, exercise and control of the invention set forth therein. That your orator and its licensees have expended large sums of money in building machines for manufacturing expanded sheet metal, operating in accordance with the method set forth and claimed in Letters Patent No. 527,242, and your orator is able to supply the entire demand for machines adapted to be used in the practice of said process, and such machines have gone into extensive use by your orator's licensees who have paid large sums of money therefor to your orator.

3rd. That the invention aforesaid for which said patent was granted was and is very valuable and important, and the exclusive right to the possession and control of said patented invention as applied to and embodied in machines for manufacturing expanded sheet metal has been and still is of great advantage and profit to your orator, and but for the wrongful acts of the defendant as heretofore charged, your orator would have derived and received still further and greater benefits from the exclusive rights and privileges granted and secured by said patent. That said patent has been generally acknowledged as valid and acquiesced in in all parts of the United States; and the claims of your orator to the exclusive right of said invention under said patent have also been generally acknowledged and acquiesced in. And that since it became the

owner of said invention as aforesaid, it and its licensees have
4 invested and expended large sums of money and been to
great labor and exertion in and about the said invention and for the purpose of carrying on the business of manufacturing expanded sheet metal and making the same profitable to themselves and useful to the public.

4th. That the defendant, as your orator believes and charges, at the time it commenced the infringements hereinafter mentioned, had full and actual notice of your orator's said patent.

5th. Yet the defendant, well knowing the premises and the rights secured to your orator as aforesaid, but contriving to injure your orator and to deprive it of the benefits and advantages which might accrue unto it from said invention, after the issue of said Letters Patent aforesaid, and before the commencement of this suit, did, as your orator is informed, believes and charges, without the license or allowance and against the will of your orator, and in violation of its rights and in infringement of the aforesaid Letters Patent within the Eastern Division of the Northern District of Ohio, and elsewhere in the United States, unlawfully and wrongfully, and in defiance of the rights of your orator, make expanded sheet metal by the use of the method set forth in the claims of said Letters Patent No. 527,242, and still continues and is threatening to continue so to do.

All in defiance of the rights acquired by and secured to your orator as aforesaid and to its great and irreparable loss and injury.

6th. And your orator further shows unto your Honors on information and belief that the defendant has made and sold a large amount of expanded sheet metal by the use of the process or method of said patent No. 527,242, and has made and realized large profits and advantages therefrom; but to what extent and how much exactly your orator does not know and prays a discovery thereof,
5 and your orator says that the use of the said invention by said
defendant and its preparations for and avowed determination to continue the same and its other aforesaid unlawful acts in disregard and in defiance of the rights of your orator have the effect to and do encourage others to venture to infringe said patents in disregard of your orator's rights.

7th. And to the end therefor that your orator may have such relief as it can obtain in a court of equity, your orator prays your Honors:

That the defendant may be required according to the best and utmost of its knowledge, remembrance, information and belief, to make full, true and direct answer to the matters hereinbefore stated and charged, but not under oath, which is hereby expressly waived.

That the defendant may be decreed to make full discovery of and account to your orator for all the expanded sheet metal made by the defendant by the method set forth and claimed in said patent No. 527,242.

That the defendant may be decreed to pay to your orator all damages which your orator has or will have sustained by reason of any and all the infringements herein complained of, and also all profits which the defendant has realized therefrom.

That the defendant, its attorneys, agents, workmen and servants may by decree of this Honorable Court be perpetually enjoined and restrained from making expanded sheet metal by the use of the process set forth in said patent No. 527,242, and from in any manner infringing upon said Letters Patent, and that the defendant may likewise be enjoined and restrained to the same effect while this cause is proceeding to final order and decree; that the defendant may be further required to pay the costs of this suit, and that your orator may have such other relief as the equity of this case may require, and as your Honors may deem to be just and right.

6 8th. May it please your Honors to grant unto your orator not only a writ of injunction conformable to the prayer of this bill, and an injunction *pendente lite* to the same effect until further order, but also a writ of subpœna directed to the defendant, the General Fireproofing Company, commanding it to appear and answer this bill of complaint and to do and receive what to your Honors may seem meet in the premises.

(Signed) THE EXPANDED METAL CO.
OSCAR BRADFORD, *President.*

MUNDAY, EVARTS & ADCOCK,
Solrs. and Of Counsel.

UNITED STATES OF AMERICA,
State of Illinois, County of Cook, ss:

On this 8th day of February, A. D. 1904, before me personally appeared Oscar Bradford, who made solemn oath that he is the president of the Expanded Metal Co., the complainant corporation in the foregoing bill of complaint, and that he has read and subscribed the same for and on behalf of said company, and that he knows the contents thereof, and that the same is true of his own knowledge, except as to matters and things therein stated on information and belief, and as to those matters he believes it to be true.

(Signed) OSCAR BRADFORD.

Subscribed and sworn to before me at the City of Chicago, this eighth day of February, A. D. 1904.

[SEAL.] H. M. MUNDAY,
Notary Public.

Circuit Court of the United States, Northern District of Ohio, Eastern Division.

In Equity on U. S. Patent No. 527,242.

THE EXPANDED METAL CO.
vs.
THE GENERAL FIREPROOFING COMPANY.

The Answer of the General Fireproofing Company, Defendant, to the Bill of Complaint of the Expanded Metal Co., Complainant.

The defendant, the General Fireproofing Company, now and at all times hereafter saving and reserving all and all manner of benefits and advantages of exception that can or may be had to the many errors, uncertainties and insufficiencies in the complainant's said bill of complaint contained, for answer thereunto or unto so much or such parts as it is advised it is material for it to make answer unto, answering, says:

First. That the defendant has no knowledge or information sufficient to form a belief as to whether the complainant, The Expanded Metal Co., is a corporation created and existing under and by virtue of the laws of the State of Missouri, and a citizen of said state and of the United States as alleged in the said bill of complaint, and it therefore denies the same and leaves the complainant to make such proof thereof as it may be advised is material.

Second. The defendant admits that it, The General Fireproofing Company, is a resident of Youngstown, Ohio, in the Northern District of Ohio, Eastern Division, and has a regular place of business in said city in the Northern District of Ohio, Eastern Division.

8 Third. The defendant admits that Letters Patent of the United States, No. 527,242, were on the 9th day of October, A. D. 1894, granted and issued to the Expanded Metal Co. as assignee of one John F. Golding for an alleged Method of Making Expanded Sheet Metal, but whether or not due proceedings in all respects according to the requirements of the statutes in such case made and provided were had, the defendant does not know and has no information save by said bill, and it leaves the complainant to make such proof thereof as it may be advised.

Fourth. And the defendant, further answering, upon information and belief, denies that on or prior to the seventh day of May, A. D. 1894, one John F. Golding, then of Chicago, Illinois, became and was the original and first inventor of certain new and useful improvements in Method of Making Expanded Sheet Metal, made the subject of said Letters Patent of the United States No. 527,242; and it denies that the said improvements were not known or used by others in this country, nor patented or described in any printed publication in this or any foreign country before the said alleged

invention of the said John F. Golding; and it further denies that the said alleged invention or improvements in Method of Making Expanded Sheet Metal was not in public use or on sale for more than two (2) years prior to his application for said patent and was not abandoned or proved to have been abandoned and that it denies upon information and belief that no applications for foreign patents for the same invention were filed more than twelve (12) months prior to the filing of the application for said improvements in this country; and it further denies upon information and belief that the said John F. Golding on the 7th day of May, A. D. 1894, made application in due form of law to the Commissioner of Patents of the United States for Letters Patent upon said invention and duly swore to the specification thereof, but to the contrary thereof, it
alleges that the said Letters Patent were not duly applied for,
9 nor were they lawfully issued or granted; and upon information and belief as aforesaid, it denies that the said John F. Golding was the true, original and first inventor of the said alleged improvements which are described and claimed in or purported to be secured by the said Letters Patent; and it denies that the said improvements were at the time of the said alleged invention thereof by the said John F. Golding either new or useful or that they were not known or used by others in the United States before his said pretended invention; and it further denies on information and belief that an instrument in writing or any instrument purporting to be dated the second day of May, A. D. 1894, was duly executed and delivered and recorded in Liber F-49, page 445, of Transfers of Patents in the Patent Office of the United States, by virtue of which John F. Golding sold and assigned unto The Expanded Metal Co. the said improvements, and authorized the Commissioner of Patents to issue Letters Patent thereon to The Expanded Metal Co. as assignee of the entire interest therein.

Fifth. And the defendant, further answering, on information and belief, denies that the complainant herein and its alleged licensees have heretofore exclusively exercised and enjoyed the rights and franchises purported to be granted by said patent, and that ever since the granting of the said patent the said complainant has been and still is entitled to the exclusive possession, exercise and control of the invention purported to be set forth therein; and the defendant further denies on information and belief, that the complainant and its alleged licensees have expended large sums of money in building machines for manufacturing expanded sheet metal, operating in accordance with the alleged method set forth and attempted to be claimed in Letters Patent No. 527,242; and the defendant denies that the complainant is able to supply the entire demand for machinery adapted to be used in the practice of said process,
10 and it denies that such machines have gone into extensive use by the complainant's alleged licensees, who, it is alleged, have paid large sums of money therefor to the complainant.

Sixth. The defendant, further answering, on information and belief, denies that the alleged invention for which said patent was granted was and is very valuable and important and denies that the exclusive right to the possession and control of said patented invention as applied to and embodied in machines for manufacturing expanded sheet metal has been and still is of great advantage and profit to the complainant herein, and it denies that but for the alleged wrongful acts of the defendant, or any acts of the defendant, the complainant would have derived and received still further and greater benefits from the exclusive rights and privileges to be granted and secured by said patent. The defendant, on information and belief, further denies that said patent has been generally acknowledged as valid and acquiesced in all parts of the United States or in any part thereof, and denies that the claims of the complainant to the exclusive rights to said invention under said patent have also been generally acknowledged and acquiesced in, and the defendant further denies that since the complainant herein became the owner of the said alleged invention it and its licensees have expended large sums of money and have been to great labor and exertion in and about the said invention and for the purpose of carrying on the business of manufacturing expanded sheet metal and making the same profitable to themselves and useful to the public.

Seventh. And the defendant further answering on information and belief, denies that at the time it is alleged to have commenced the alleged infringement thereof mentioned in bill, it had full and actual notice of complainant's patent, and it denies on information and belief that it has ever had such notice.

11 Eighth. The defendant, further answering, denies that well knowing the premises and the alleged rights purported to be secured to complainant, it continued to injure the complainant herein or deprive it of the benefits and advantages or any benefits or advantages which might or otherwise would accrue unto it from said invention; and the defendant denies that it did after the issue of said Letters Patent and before the commencement of this suit, without the license or allowance and against the will of the complainant, and in violation of its alleged rights and in infringement of the aforesaid Letters Patent, within the Eastern Division of the Northern District of Ohio or anywhere else in the United States unlawfully and wrongfully, and in defiance of any alleged rights of the complainant, make expanded sheet metal by the use of the alleged method purported to be set forth in the claim of said Letters Patent No. 527,242; and it denies that it is still continuing and is threatening to continue so to do; and the defendant further denies that it has acted in defiance of any alleged rights purported to be secured by or secured to the complainant herein, in the matter set forth, and it denies that the complainant has had great and irreparable loss and injury or any loss and injury whatsoever.

Ninth. The defendant, further answering, denies that it has made and sold a large amount of expanded sheet metal by the use of the alleged process or method of said patent No. 527,242, and denies that it has made and realized large profits and advantages therefrom; and the defendant further denies that it has used said alleged invention and that it is making preparation for and has avowed determination to continue the same, and it denies that its alleged unlawful acts or any of its acts have been in disregard of any of the alleged rights of the complainant, and it denies that others have been encouraged to venture to infringe said patent in disregard of the complainant's alleged rights.

12 Tenth. And the defendant avers on information and belief that the matter alleged to be covered by said Letters Patent No. 527,242 is not an invention.

Eleventh. And the defendant avers on information and belief that the matter alleged to be covered by the said Letters Patent No. 527,242 was not novel and did not involve or require invention at the date when the said John F. Golding is alleged to have invented it, but was obvious from the prior art without patentable quality, and that the said Golding did not originate the same, but obtained knowledge of it from the prior art.

Twelfth. And the defendant avers on information and belief that the matter alleged to be covered by the said Letters Patent have been in public use and on sale in this country for more than two (2) years before the application for said Letters Patent; and it further alleges that the same was abandoned to the public.

Thirteenth. The defendant avers on information and belief that the invention claimed in the said Letters Patent as issued is substantially different from that indicated, suggested or described as the invention in the original application and the patent is therefore null and void; and further that new matter was introduced into the application substantially altering the character of the invention claimed and without the oath of the applicant, and the patent is therefore null and void.

Fourteenth. And the defendant avers on information and belief that for the purpose of deceiving the public the description and specification of said Letters Patent filed in the Patent Office was made to cover less than the whole truth relevant to the alleged invention or was made to cover more than was necessary to produce the desired effect.

Fifteenth. The defendant avers on information and belief that the description of the alleged invention in the specification of said patent is not such full, clear, concise and exact terms as to
13 enable any person skilled in the art to which it pertains or with which it is most nearly connected to make, construct and use the same.

Sixteenth. And the defendant avers on information and belief that the claim of the patent is indistinct and the patentee has not therefore particularly pointed out and distinctly claimed the matter which he claims as his invention, but to the contrary, has made a vague and nebulous claim that is calculated to mislead and deceive the public, and that the patent is therefore null and void.

Seventeenth. And the defendant further avers on information and belief that the alleged invention claimed in said Letters Patent is substantially identical with one or more inventions claimed in prior patents granted on the applications of the same inventor, John F. Golding.

Eighteenth. The defendant avers on information and belief that the complainant herein if it ever had any right of action against defendant has lost the same by laches and delay in prosecuting its alleged rights.

Nineteenth. The defendant avers on information and belief that the matter alleged to be covered by said Letters Patent is not a patentable invention because the claim of the patent is for mere function, and, although drawn to cover an alleged process, as a matter of fact, involves nothing more than the functions and operation of a piece of mechanism or the abstract effect of a machine.

Twentieth. The defendant avers on information and belief that the matter covered by the said Letters Patent purports to relate to the statutory class of invention of a new and useful art, whereas, in reality, the invention, if any, resides in a different statutory class of invention—namely, an article of manufacture or a machine.

Twenty-first. And the defendant avers that long prior to any invention by the said John F. Golding of the alleged improvement described and claimed in the said Letters Patent the same and
14 all the material and substantial parts thereof were fully described and shown in the following Letters Patent of the United States, to wit:

Letters Patent of the United States.

No. 23,597, granted April 12, 1859, to J. W. Mauterstock.

No. 297,382, granted April 22, 1884, to J. F. Golding.

No. 320,240, granted June 16, 1885, to J. F. Golding.

No. 320,242, granted June 16, 1885, to J. F. Golding and G. B. Durkee.

No. 400,774, granted April 2, 1889, to I. Kinney.

No. 408,599, granted August 6, 1889, to I. Elkins.

No. 447,085, granted February 24, 1891, to L. L. Sagendorph.

No. 475,700, granted May 24, 1892, to G. A. Ohl.

No. 214,038, granted April 8, 1879, to John V. Hennessey.

No. 381,230, granted April 17, 1888, to J. F. Golding.

No. 381,231, granted April 17, 1888, to J. F. Golding.

English Patents.

No. 2,125, July 26, 1862, Thomas Long.

And divers other Letters Patent and printed publications to this defendant at present unknown, but which, when discovered, it prays may be referred to and said reference added to and made a part of this, its answer.

Twenty-second. And the defendant avers that long before any invention by the said John F. Golding of the alleged improvement described and claimed in said Letters Patent, the same were known and used by the following persons at the places opposite their names, to wit:

By J. W. Mauterstock, of New York, N. Y., at New York, N. Y., and elsewhere.

15 By J. F. Golding, of Chicago, Illinois, at Chicago, Illinois, and elsewhere.

By J. F. Golding and G. B. Durkee, of Chicago, Illinois, at Chicago, Illinois, and elsewhere.

By G. B. Durkee, of Chicago, Illinois, at Chicago, Illinois, and elsewhere.

By Israel Binney, of Windsor, Ont., Canada, at Windsor, Ont., Canada, and elsewhere.

By Ira S. Elkins, of New York, N. Y., at New York, N. Y., and elsewhere.

By Longley L. Sagendorph, of Philadelphia, Pa., at Philadelphia, Pa., and elsewhere.

By George A. Ohl, of Newark, N. J., at Newark, N. Y., and elsewhere.

By John V. Hennessey, of Albany, N. Y., at Albany, N. Y., and elsewhere.

By Thomas Long, of Clarendon Place, Notting Hill, in the County of Middlesex, England.

Twenty-third. The defendant, further answering on information and belief, denies each and every other allegation in the said bill of complaint contained, except such as are herein expressly admitted to be true.

And the defendant prays the same benefits of the facts and things herein set forth, as if for the reason thereof it had demurred to the said bill, where a demurrer would have been proper, and the same benefit thereof as if it had specially pleaded to said bill where a plea would have been proper.

The defendant, further answering, denies the equity of complainant's bill of complaint and says that the said complainant is not entitled to any injunction or to damage, nor to account of profits, nor to any other relief against the defendant, as prayed for in the said bill of complaint, and the defendant denies all the unlawful combinations and confederacy in the said bill charged, and the defendant, further answering, on information and belief, denies every allegation in said bill of complaint contained not hereinbefore 16 admitted, answered or denied; all of which matters and things the defendant is ready to aver, maintain and prove as this Honorable Court may direct, and humbly prays to be hence dismissed with its reasonable costs and charges in this behalf most wrongfully sustained.

Dated July 1, 1904.

THE GENERAL FIREPROOFING
COMPANY,
By W. A. KINGSLEY, *Treasurer.*

[CORPORATE SEAL.]

Attest:
H. B. McMASTER,
Ass. Secretary.

DICKERSON, BROWN, RAEGENER &
BINNEY, *Solicitors for Defendant.*

HAROLD BINNEY,
Of Counsel for Defendant.

17 Circuit Court of the United States, Northern District of Ohio, Eastern Division. In Equity.

THE EXPANDED METAL CO.
vs.
THE GENERAL FIREPROOFING COMPANY.

The replication of the Expanded Metal Co., complainant, to the answer of the General Fireproofing Company, defendant.

This repliant, saving and reserving to itself all and all manner of advantage of exception to the manifold insufficiencies of the said answer, for replication thereunto say that it will aver and prove its said bill to be true, certain and sufficient in the law to be answered unto, and that the said answer of the said defendant is uncertain, untrue and insufficient to be replied unto by this repliant, without this, that any other matter or thing whatsoever in said answer contained, material or effectual in the law to be replied unto, confessed and avoided, traversed or denied, is true; all which matters and things this repliant is and will be ready to aver and prove, as this Honorable Court shall direct, and humbly prays, as in and by its said bill it has already prayed.

MUNDAY, EVARTS & ADCOCK,
Solicitors for Complainant.

18 Circuit Court of the United States, Northern District of Ohio, Eastern Division. In Equity.

THE EXPANDED METAL CO.
vs.
THE GENERAL FIREPROOFING COMPANY.

Messrs. Dickerson, Brown, Raegener & Binney, 141 Broadway, N. Y., Solicitors for Defendant.

GENTLEMEN: Please take notice that the plaintiff herein will take the testimony of John F. Golding, who resides more than one hundred miles from the place of trial herein, and more than one hundred miles from any place at which a Circuit Court of United States for the Eastern Division of the Northern District of Ohio is appointed to be held by law, for use on behalf of complainant, before H. M. Munday, a notary public in and for the County of Cook and State of Illinois, who is not of counsel, nor interested in this cause, at the office of Munday, Evarts & Adcock, at No. 204 Dearborn street in the City of Chicago and State of Illinois, on the 17th day of August, at 10 o'clock A. M. and thereafter from day to day as the taking of the deposition may be adjourned, and such testimony will be so taken in accordance with the provisions of Sections 863, 864 and 865 of the Revised Statutes of the United States and the equity rules.

MUNDAY, EVARTS & ADCOCK,
Solicitors for Complainant.

Dated at Chicago, this 8th day of August, A. D. 1904.

Service accepted this 10th day of August, A. D. 1904.
(Sigd.) DICKERSON, BROWN, RAEGENER & BINNEY.

19 In the Circuit Court of the United States for the Northern District of Ohio, Eastern Division. In Equity.

THE EXPANDED METAL CO.
vs.
THE GENERAL FIREPROOFING COMPANY.

At Chicago, Illinois, on this 17th day of August, 1904, before me, Harrison M. Munday, a notary public. Present, John W. Munday, Esq., for complainant, and H. G. Ogden, Jr., Esq., for defendant.

Evidence produced on behalf of complainant in the above entitled cause, pursuant to the annexed notice.

And thereupon complainant's counsel asked defendant's counsel if he can produce a sample of the defendant's manufacture, as mentioned in the correspondence recently had between counsel.

Counsel for defendant states that he has here a sample of the expanded metal which was sent to Mr. Harrold Binney, of counsel for defendant, from Youngstown, Ohio, by the General Fireproofing Company, at Mr. Binney's request, and in pursuance to the correspondence referred to by complainant's counsel.

It is hereby stipulated between counsel for the respective parties that the sample produced represents the expanded metal as made by the defendant and complained of in the bill of complaint. In the sample the expanded portion is purposely left attached to a part of the sheet from which it was cut.

By Mr. MUNDAY: I assent to the foregoing stipulation.
By Mr. OGDEN: I assent to the foregoing stipulation.

The sample referred to in the foregoing stipulation is here offered in evidence on behalf of the complainant, the same to be marked "Complainant's Exhibit No. 1, Sample of Defendant's Ex-
20 panded Metal Manufacture."

I certify that I have marked the said exhibit as above.

H. M. MUNDAY,
Notary Public.

Complainant's counsel here offers in evidence a duly certified copy under the seal of the State of Missouri, one of the United States of America, of the certificate of corporate existence of the complainant corporation—The Expanded Metal Co., the same to be marked "Complainant's Exhibit No. 2—Certificate of the Incorporation of The Expanded Metal Co."

I certify that said exhibit has been so marked.

H. M. MUNDAY,
Notary Public.

It is hereby stipulated between counsel that in the course of this litigation, printed or United States Patent Office copies of the United States patents, and Patent Office printed copies of foreign patents may be used in evidence with the same force and effect as the original documents might be used if produced, subject to correction by the production of the originals or certified copies thereof in case of error.

By Mr. Munday: I assent to the foregoing stipulation.
By Mr. Ogden: I likewise assent.

Under the foregoing stipulation complainant's counsel offers in evidence printed Patent Office copy of Letters Patent No. 527,242, granted to John F. Golding, assignor to the Expanded Metal Co. of Missouri, dated October 9, 1894, for Method of Making Expanded Sheet Metal, the same being the Letters Patent sued on in this cause, said patent to be marked "Complainant's Exhibit No. 3, the Golding Patent in Suit."

I certify that said exhibit has been so marked.

H. M. MUNDAY,
Notary Public.

21 Complainant's counsel also offers in evidence a certified copy from the records of the Patent Office of a certain assignment dated May 2, 1894, from John F. Golding to the Expanded Metal Co., and the same to be marked "Complainant's Exhibit No. 4, Assignment of the Patent in Suit."

I certify that said exhibit has been so marked.

H. M. MUNDAY,
Notary Public.

And thereupon John F. Golding, the witness named in the notice, was produced, and being duly sworn, testifies as follows in response to interrogatories by John W. Munday, Esq.:

Q. 1. What is your name, age, residence and occupation?

A. John F. Golding; residence, 315 West Ninety-seventh street, New York City; my age, 56 years; my occupation, that of mechanical engineer.

Q. 2. Are you the John F. Golding named in the letters patent Exhibit No. 3, the Golding patent?

A. I am.

Q. 3. And in the assignment Exhibit No. 4 assignment?

A. I am.

Q. 4. Do you know whether or not the assignment referred to, a certified copy of which is in evidence, relates to the invention which is the subject-matter of the said patent sued on, Complainant's Exhibit No. 3?

A. I know it does.

By Mr. Ogden: Answer is objected to as irresponsive, because the witness has not stated why he believes the assignment, Exhibit 4, relates to the Golding patent Exhibit 3.

Q. 5. Please look at the Complainant's Exhibit No. 1 and state whether or not you can, from an inspection of that sample,
22 state how the expanded metal therein shown was made?

By Mr. Ogden: Objected to as calling for the mere opinion of the witness.

By Mr. Munday: Question withdrawn.

Q. 6. State what experience, if any, you have had, in the m
facture of expanded metal by different processes, which might
to qualify you to express an opinion as to the method of manu
ture employed in the production of any given sample of expa
metal?

A. I first invented the original expanded metal as shown in
patent. I subsequently produced a machine for slitting metal
paratory to such metal being expanded; to be more correct, ha
the sheet expanded. I subsequently invented the process for si
taneously cutting a sheet of metal and opening the metal on the
of the cut, so as at one operation to produce a complete m
Following this I invented the machine for carrying out this pr
and improved said machine and took patents on both said mach
and improvements. Later I invented the process for manufactu
expanded metal, the infringement of which is a cause of this ac
and following this invention I invented and patented the mach
which produces this metal. Since the original invention I have
continually engaged in and interested in the manufacture of
panded metal.

Answer objected to by Mr. Ogden as vague and indefinite,
sponsive, as totally inadequate to qualify witness to express
opinion called for.

Q. 7. Please look at the Complainant's Exhibit No. 1 and
whether or not you can, from an inspection of that sample, state
the expanded metal therein shown was made?

Same objection as to question 5.

A. From an inspection I can tell how it was produced.

23 Q. 8. Please state whether or not the open or reticul
metal work of that sample was made by simultaneously
ting and bending portions of a plate or sheet of metal in such m
ner as to stretch or elongate the bars connecting the slit portions
body of the plate, and then similarly bending in places alternat
the first mentioned portion, thus producing the finished expan
sheet metal of the same length as that of the original sheet or plat

Same objection.

A. I answer in the affirmative, and I say that this metal is m
by the process described in the patent at issue, by being simult
ously cut, stretched and bended away from the plate at intervals,
subsequently similarly cut, stretched and bent away from the p
at points back of the intersections of the strands of the metal m
by the first cut. This is evidenced as shown in the sample be
me, wherein the length of the strand between the points which c
nect these strands with the uncut metal is greater than the dista
between such points by the difference in the measure of the stra
and the measure of the metal on the straight line between the poi
of intersection and on the line of the uncut metal.

Q. 9. Please measure the distance on the uncut plate from cen
to center of the intersection or attachment of the strands with
plate, and also measure the distance from one of these points

the other along the course of the bent strands, and state the difference in inches or parts of an inch.

A. I have marked the metal as nearly as possible at the centers of metal connected with the uncut sheet, and find that the distance between these points is six inches and five-sixteenths of an inch, and that the measure following the made strands from one of such points to the other is six inches and fifteen-sixteenths of an inch. The difference is five-eighths of an inch, or ten-sixteenths of an inch. It is, therefore, obvious that the greater length of the 24 strand was produced by its being stretched, and that this stretching was done simultaneously with the act of cutting such strands away from the plane of the uncut metal. The cut edges of the metal bear the marks of the cutter on lines perpendicular to the plane of the sheet. To produce such a cut and stretch of metal the plate must necessarily rest upon a straight bed knife, and the presence of such knives is shown by the line on the under side of the cut metal at the intersections of the meshes, that is, also along the plate where the metal still remains connected with it.

That portion of the answer beginning with the words, "and it is, therefore, obvious," is objected to as volunteered and irresponsive; and, furthermore, the portion of the answer referred to is objected to as containing mere deductions, conclusions and opinions.

Q. 10. Do you know the defendant corporation, the General Fire Proofing Company?

A. I have been at their offices.

Q. 11. Have you ever been at their factory?

A. I have.

Q. 12. Whereabouts is it located?

A. A place called Crab Creek, near Youngstown, Ohio.

Q. 13. When were you there at their factory?

A. About the 20th of February, this year. The occasion of my visit was having seen a piece of their metal in January, brought to our Pittsburg office by Mr. Samuel Garrison, who is now the representative of the General Fireproofing Company at Pittsburg.

Q. 14. Do you mean that in January of the present year Mr. Garrison showed you a piece of expanded metal produced by the General Fire Pro-fing Company, and that subsequently, on the 20th of February, you went to the factory of the General Fireproofing Company?

Objected to as grossly leading and manifestly improper direct examination.

25 A. I said that while at Pittsburg in January of this year I saw a piece of expanded metal which Mr. Garrison had brought from Crab Creek to the office of the Central Expanded Metal Co. of Pittsburg. It was on or about the 20th of February that I visited the office of the General Fireproofing Company at Crab Creek.

Q. 15. When you was at Crab Creek, what did you see, if anything, in relation to the manufacture by the General Fireproofing Company of expanded metal?

A. I saw small samples, probably a foot square, setting about the office of the general manager, Mr. Kingsley.

Q. 16. Compare the samples which you saw at Crab Creek with the sample which Mr. Garrison brought from Crab Creek and that you saw in the January preceding.

A. The samples at Crab Creek were leaning against the walls of the office at a distance from twenty or thirty feet from where I sat. There was probably twenty or thirty pieces. Their appearance were the same in size of mesh and strand as to the sample which their agent at Pittsburg had brought from their works, and which sample I now have in the office here. The sample I have in my hand is the piece given me at the Pittsburg office. I conversed with Mr. Garrison respecting this metal and the infringers at Crab Creek, near Youngstown. I should explain that he was not at that time known to us to be in treaty with the General Fireproofing Company for the Pittsburg agency. And he spoke very freely about what they were doing at the factory of the General Fireproofing Company. This was in January of this year.

Q. 17. Please confine your answers to my questions.

By Mr. OGDEN: Counsel for defendant objects to counsel for complainant instructing the witness, either on or off the stand.

And counsel for complainant objects to counsel for defend-
26 ant interrupting his question with objections. There is plenty
of time to object to the question after it has been put down
on the record, and if counsel for defendant is liable to forget the
substance of the proposed objection, it is suggested that he had bet-
ter make a written memorandum of his objection and hold it.

Q. 18. Question 17 resumed. Please confine your answers to my questions as far as you can do so. How do you know that the General Fireproofing Company made this sample which you produce here now as being the sample which you saw in Pittsburg?

Counsel for defendant regrets that he interrupted the question about to be put by complainant's counsel, but he did not understand that this was a question and thought that complainant's counsel had finished what he was saying on the record.

A. I know this to be the sample which I saw in Pittsburg for the reason that I took it away with me. I answered this partly in my answer preceding the last question, and from the fact that it registers with the Exhibit No. 1.

Q. 19. How do you know that this sample which you produced and which you say was the sample you saw in Pittsburg, and which you further say you brought from Pittsburg with you here, was made by the General Fireproofing Company? In answering this question please state all the reasons you know for believing the sample was made by the General Fireproofing Company.

Question objected to as immaterial and irrelevant, and having no bearing on the question at issue in this suit.

A. I have stated how I have obtained the metal, of my conversation with Mr. Garrison, of the fact that it is in size and form and

mesh as Exhibit No. 1; that the meshes in both these samples at the intersection of the meshes, measuring the long way of the
27 mesh, are the same, as also crosswise of the mesh, and that they are more than a quarter of an inch longer the lengthwise of the mesh than are the meshes of the metal manufactured by the Central Metal Manufacturing Company at Pittsburg. This is an exactly similar mesh to the sample handed me by Mr. Ramsey, the general agent in Chicago of the General Fireproofing Company, at which time Mr. Ramsey saying this is a sample of the mesh which the General Fireproofing Company were making; he had many such samples in his office, in small bundles, each bearing the tag of the General Fireproofing Company.

Answer is objected to as hearsay. Also objected to as irrelevant and immaterial and in no way proving the sample under discussion.

Recess here taken until two o'clock this day.

Two o'clock P. M., met pursuant to recess.
Present as before.

By the WITNESS: I wish to correct my statement as to the time of my visit to the works of the General Fireproofing Company at Crab Creek. I find, on referring to my correspondence, that it was in January of this year, instead of February, that I was there. It was on the 20th of January that we had a meeting of the Expanded Metal Company of Pittsburg, and Mr. Bullard, president of the Expanded Metal Company of New England, went with me to Crab Creek.

Counsel for defendant notes upon the record that the above statement of witness is made after recess and after he has refreshed his memory, as he states, by referring to his correspondence. This statement of witness is protested against and counsel for defendant calls upon counsel for complainant to produce the correspondence referred to by the witness.

Counsel for defendant notes on the record that complain-
28 ant's counsel will make no reply to request for the production of correspondence produced, and notice is given that at proper time application will be made to the court for the production of the papers referred to, if they are not produced before this witness leaves the stand.

Q. 20. You referred to two samples of expanded metal which you produced, one a large one and one a small one. The large one, as I understand it, you saw in Pittsburg prior to your visit to the defendant's factory at Crab Creek, and the smaller sample, as I understand it from your testimony, was given to you by Mr. Ramsey, the general agent for the defendant, in Chicago. Is that right?
A. That is correct.

The two samples produced by the witness are offered in evidence on behalf of the complainant to be marked, respectively, the large sample "Complainant's Exhibit No. 5 Sample," and the smaller one "Complainant's Exhibit No. 6 Sample."

I certify that I have marked the exhibits as above.

H. M. MUNDAY,
Notary Public.

By Mr. OGDEN: These exhibits are objected to as not proved, and furthermore as immaterial and irrelevant.

Q. 21. Compare these two exhibits, "Complainant's Exhibit No. 5 Sample" and "Complainant's Exhibit No. 6 Sample," with "Complainant's Exhibit No. 1 Sample," which is stipulated to represent the defendant's manufacture, and state whether or not the samples are identical in size of mesh, shape of mesh, width of strand and general appearance?

A. The three samples are from the same standard size cutter and all alike, with the exception that the Exhibit No. 1 is made from a slightly heavier sheet, and the small exhibit, No. 6, has been
29 annealed, as shown by the blue oxide, and is consequently slightly contracted by annealing.

Q. 22. Have you a sample of expanded metal made by your patented process of the patent in suit; and, if so, please produce it?

A. I have two samples of expanded metal made by my process, one showing part of the metal manufactured in complete diamond shape meshes and part with only a half of a mesh completed. The other sample shows a small portion of a mesh cut and stretched.

The two samples produced by the witness are offered in evidence on behalf of complainant, the same to be marked, the first named one "Complainant's Exhibit No. 7, Sample of Golding Process Work" and the last named one "Complainant's Exhibit 8, Second Sample of Golding's Process Work."

I certify that I have marked the exhibits as above.

H. M. MUNDAY,
Notary Public.

The exhibits 7 and 8 objected to as not sufficiently proved.

Q. 23. How extensively, if at all, is your patented process of making expanded sheet metal consisting of reticulated metal work by simultaneously slitting and bending portions of a plate or sheet of metal in such manner as to stretch or elongate the bars connecting the slit portions and body of the sheet or plate and then similarly slitting and bending in places alternate to the first mentioned portion, been used under your licenses and permittance?

Objected to as leading.

A. It is made extensively in Pittsburg, Boston, Chicago, in Canada, England, France, Germany, Austria, Spain, Russia and Belgium and Hungary.

Q. 24. State what are the advantages in the product that are due to this process of making it, if any?

30 A. The process enables us to cut plates of steel of up to half an inch in thickness, that is, ranging up to such thickness from the light steel sheets of 26 gage. The process insures the

strands to be of a uniform width and of almost absolute straightness, and that the intersections of the strands are at exact right angles with each other, laying crosswise and longitudinally. The process provides for the simultaneously cutting and stretching all parts of the strands uniformly. A half a mesh is produced in a single operation, the next cut is made back of the intersection of the half diamond already formed, and is similarly cut, bent and stretched without disturbing the form of the half diamond previously produced, this is because in the process of manufacture the two ends of the meshes are tied by uncut metal to the main body of the sheet, producing uniform qualities of the whole sheet, and hence its reliability of strength for use in concrete work where it is employed as a tension member. The stretching of a strand also stiffens the metal and actually increases its ultimate breaking strain above any other piece of metal of similar size otherwise cut from same plates. This has been shown by actual test to range at about 18 per cent. increase of strength. The squareness of the intersections crosswise with those long ways of the mesh renders it exceedingly convenient for the manufacture of numerous articles, where as metal made by former processes were deficient in these latter qualities and restricted as to thickness of plates that could be cut. No heavier than 3-32nd of an inch metal was ever used in practicing my former process. It is also a great advantage to have the product remain the same length as the sheet from which it is being made.

Q. 25. I believe you were present in court in Cleveland when the demurrer was overruled. One ground of this demurrer was that the patented process is a mere function of the machine by use of which it is practiced. I wish you would state, as a matter of fact,
31 which it was that you invented first, the process of the patent in suit or the machine which is used to practice the process?

Question objected to as incompetent, irrelevant, immaterial, and because it assumes that a process was invented by witness which was not the function of the machine.

A. I conceived the idea that expanded metal could be made by cutting and forcing the strands away from the plate by stretching or elongating the strands. I expressed this belief to Mr. Bradford, who was president of our company, and became so convinced that it could be done that I repaired very early the next morning to a shop where I could have some conveniences and there had an ordinary cold chisel shaped on its end almost exactly like the half diamond produced on Exhibit 7, only of course very much smaller, the length of the cut was the width of the chisel, about an inch and an eighth, and the depth of the cut was about a quarter of an inch. I fixed a piece of thin sheet metal into a vise and produced the chisel, a number of half meshes then lifted the metal in the vise the width of strand required, which was about an eighth of an inch, and then operated with the chisel on the second row of cuts, which produced the full diamond mesh. I showed this result to Mr. Bradford and took steps shortly afterwards to protect the process by patent. My next step in the line of experiment was to make a blade with several

small cutters and fix them in an ordinary punching machine, ordinary shearing machine, I should say, which had a straight lower cutter about six inches in length. Between these I fed a blank piece of sheet steel and produced a number of further specimens. All of this action of mine long proceeded the invention of the machine that I patented for the manufacture of expanded metal by the process. Being confirmed by these experiments that the process was correct, I set about making sketches of the fundamental part of the
32 machine, and after having taken patents upon the machine,
or applied for patents on the machine. I visited the English company's works at Westhartelpool, England, and there by discarding all of the cutting and binding devices used in the old style of machine, rebuilt several of them to manufacture metal under the new process. It was not until this new process was invented that any considerable sale of expanded metal was made, excepting such as was made in very light steel, such as was used for lath in holding plaster.

Q. 26. Have you ever felt, or thought, that because you subsequently perfected a machine which would automatically perform the steps of your process, that you ought for that reason be deprived of your process patent?

A. Certainly not.

The further taking of this testimony is adjourned until to-morrow morning, August 18th, at 10 o'clock.

HARRISON M. MUNDAY.
Notary Public.

CHICAGO, ILLINOIS, *Thursday, August* 18, 1904.

Met pursuant to adjournment.

Present, as before.

Q. 26. Please look at the "Complainant's Exhibit No. 1 Sample" and state whether you find in said sample any trace or evidence that the portions of the plate of sheet metal were slit and bent at one part and then similarly slit and bent in places alternate to the first mentioned part, and state if you find such evidence, in what it consists generally.

A. There is undoubted evidence. Being familiar with the operations of the machines, I know that the defects in any one cutter will be manifest in the expanded metal at alternating sides of one diamond mesh. The fracture of the cutter by which Exhibit No. 1 was made is evidenced by the burr which is thrown out on the
33 last strand produced next to the uncut metal, and which is
found on the opposite side and preceding strand of the same mesh. Again, on the opposite side of the preceding strand of the next mesh, and so on through one row of meshes. This does not appear in the other row of meshes following from the connections of the strand at the uncut plate.

Q. 27. I believe you did not see the defendant at Crab Creek actually making any of the expanded metal?

A. I did not.

Q. 28. Did you ask the defendant or any of its officers to permit you to see the operation of making the expanded metal?

A. I did request to see the machine and its operation.

Q. 28*a*. Of whom did you make this request?

A. Mr. Kingsley, general manager of the General Fireproofing Company.

Q. 29. And what did he reply to that request?

A. He stated that their policy business had not been determined and that they had in the past refused to exhibit their machines. That they would have a board of directors' meeting the following week and if they consented to my seeing the machine, that they would advise me thereof.

Q. 30. And did they subsequently consent to your seeing the machine?

A. They have not done so, but on the contrary have refused to do so.

Q. 31. Did you hear me ask Mr. Ogden at Cleveland at the time of the argument with the demurrer for permission to have a witness examine the operation of making expanded metal at the defendant's factory?

A. I did.

Q. 32. And what did he reply?

By Mr. OGDEN: This question and this line of questioning is objected to as incompetent, immaterial, irrelevant and impertinent.

34 A. He replied that he would submit the request to the members of his firm; that he had no doubt but that the request would be granted.

By Mr. OGDEN: The answer is objected to as incompetent. That part of the answer beginning with "that he has no doubt" is furthermore objected to as not full and complete.

Q. 33. Do you know whether Mr. Ogden's law firm, Dickerson, Brown, Raegener & Binney, subsequently made any statement to complainant's counsel as to this matter of permission to look at the defendant's machine in operation?

A. I have read a letter dated July 28, 1904, addressed to counsel for plaintiff, and signed Dickerson, Brown, Raegener & Binney, in which they absolutely refuse to permit us, the complainant, to view their machine at Youngstown; I have the letter before me now.

By Mr. OGDEN: Answer is objected to as secondary evidence, and the production of the letter is called for so that it may be offered in evidence.

By Mr. MUNDAY: The letter produced by the witness is in the following words and figures:

"Dickerson, Brown, Raegener & Binney, Attorneys & Counsellors at Law, Washington Life Building, 141 Broadway.

New York, *July* 28, 1904.

Edward N. Dickerson.
Edwin H. Brown.
Louis C. Raegener.
Harold Binney.

Messrs. Munday, Evarts & Adcock, Marquette Building, Chicago, Ill.

Dear Sirs: *In re* Expanded Metal Co. *v.* Genl. Fireproofing Co.

35 Answering yours of July 20, 1904, in which you ask for permit to inspect alleged infringing machine at the Youngstown factory of the General Fireproofiing Co., we have taken the matter up with our clients and ascertain that they have a number of trade secrets and also a number of inventions as yet unpatented which would almost of necessity be exposed if you were allowed to examine their machinery, and as we know of no authority which would justify an order compelling them to show their various machines to you, in the absence of the slightest *prima facie* evidence of infringement and as the machine would not be, at best, proper evidence of their methods of *process* of making the expanded lath, we cannot advise their permitting Mr. Golding to have access to their plant.

We believe if you decide to apply to court for an order to inspect, we shall be able to convince the court that it would be an improper exercise of its authority to grant such an order in this case, for two very excellent reasons, but if you intend to apply for such an order, we beg you to give us as much notice as possible, and we in turn shall expect to give you as much notice as possible of the various acts on our part when our turn comes.

Very truly yours,
DICKERSON, BROWN, RAEGENER & BINNEY.
BOB. B."

By Mr. Munday: You have seen the letter, Mr. Ogden, and are you willing that the foregoing copy in the record shall stand in lieu of the original in evidence?

By Mr. Ogden: Yes, I am willing that it shall.

Q. 34. Did Mr. Kingsley say anything to you with reference to whether or not the defendant was engaged in the manufacture of expanded metal?

A. He did.

36 Q. 35. When was this?

A. In the same conversation he had about my seeing the machine, and in answer to my question as to whether they were making metal. My memory is that it was on the 20th of January, 1904, as I left New York on January 19, 1904, — to Pittsburg and went to Youngstown on the next day.

Q. 36. What did Mr. Kingsley say to you about this matter?

By Mr. Ogden: Objected to as hearsay. This question and this line of questioning and their answers relating to conversations, third parties is all objected to as incompetent.

A. He answered that they were making the metal, but he was not permitted to show me the machine, but he left my presence and in a few moments returned and said that he had telephoned to the president of his company, and that the answer of the president was "you know the policy of our company, and we cannot permit that until after our next board meeting."

By Mr. Ogden: Objected to as grossly incompetent.

Q. 37. You have spoken about the underside of the metal in "Complainant's Exhibit No. 1 Sample." Will you scratch on the underside of the sheet in that exhibit the word "underside"?
A. I have done so.

By Mr. Munday: Do you agree, Mr. Ogden, that the exhibits offered in evidence by counsel herein may be retained by counsel until the hearing, subject to production at any time on demand?
By Mr. Ogden: Yes, I consent to this.
By Mr. Munday: And I agree likewise.

Direct examination closed.

37 Cross-examination by Mr. Ogden:

X Q. 38. Mr. Golding, you seem to have had a pretty wide experience in expanded metal work. How long have you been in this line of business?
A. That was one branch of my business since my first inventions patented in 1884 and 1885.
X Q. 39. What do you mean by one branch of business?
A. I mean that until 1887 that I was also engaged in other business, but that since 1887 I have practically been engaged in no other business.
X Q. 40. I should judge from your answer in which you speak of your experience that you have taken out a good many patents. Can you state about how many you have taken out?
A. I should say about a dozen in respect to expanded metal *per se*.
X Q. 41. Do those patents include machines for making expanded metal?
A. Some of them do.
X Q. 42. I should also judge that you have experimented a good deal and probably invented meritorious processes and machines which for one reason and another have never been patented. Is that no- so?
A. I only remember of having produced two experimental machines relating to the making of expanded metal which have not been patented.
X Q. 43. I suppose you realize the danger frequently of waiting before applying for a patent, do you?

A. I understand what you mean.

X Q. 44. Do you make it a rule to apply for patents as soon as possible after you have completed an invention?

By Mr. Munday: Objected to as outside of the direct examination.

38 A. I do not think this question is within the scope of cross-examination, and irrelevant, and prefer not to go into such matters.

X Q. 45. Referring to your answer to Q. 6, you state that you first invented the original expanded metal as shown in your patent. I show you a copy of a patent granted to you April 22, 1884, No. 297,382, and ask you if this patent covers your original invention?

A. It does.

X Q. 46. You also stated that you subsequently invented the process for simultaneously cutting a sheet of metal and opening the metal on the lines of cut, so as at one operation to produce a complete mesh. I show you a copy of a patent granted to you and George B. Durkee, June 16, 1885, No. 320,242. This patent relates to the art of making slashed metallic screening, and I wish to know if this is the patent you had in mind or some other one.

A. This is the patent I referred to.

X Q. 47. Still referring to Q. 6, you stated that you invented the machine for carrying out the process and improved said machine and took patents on both said machines and improvements. I show you copies of two patents granted April 17, 1888, one numbered 381,230, and granted to J. F. Golding and G. B. Durkee, the other numbered 381,231, and granted to you solely. Are these the patents you referred to for the machine for carrying out the process?

A. I identify these two last named patents as the ones referred to, but I wish to state that I had forgotten for the moment that Mr. Durkee was associated with me in the process and first named machine and think he may have been improperly associated with me in the process patent of 1885.

X Q. 48. Which of the two patents, Nos. 381,230 and 381,231, relates to the improvement in the machine?

39 A. Patent 381,231 is the one referred to in answer to inquiry 6 as the improvement upon the machine previously referred to.

X Q. 49. You went on to state that later you "invented a process for manufacturing expanded metal, the infringement of which is the cause of this action." Am I correct in assuming that by this answer you referred to the patent in suit, No. 527,242, granted October 9, 1894?

A. The patent referred to as Exhibit 3 is the one I referred to.

X Q. 50. In the last portion of your answer to Q. 6 and after referring to the patent in suit, you stated that "following this invention, I invented and patented the machines which produced this metal." I show you copy of U. S. patent No. 581,713, granted to you May 4, 1897, and ask you if this patent covers one of the machines referred to in your answer?

A. It is the one referred to in my answer.

X Q. 51. What was the occasion of your visit to the Youngstown works at Crab Creek in the early part of this year?

A. I have already stated that I had seen a specimen of the metal made by the General Fireproofing Company and recognized it as an infringement of my patent and went there for the purpose of seeing, if possible, the material being actually made by them.

X Q. 52. How soon after Mr. Garrison showed you the piece of expanded metal you refer to did you visit Crab Creek?

A. Again I must correct you in that I did not say Mr. Garrison showed me that piece of expanded metal. I said I had seen a piece of expanded metal at our office which Mr. Garrison had brought from the Youngstown works, and that afterwards I conversed with Mr. Garrison about it. It was prior to our company's meeting at Pittsburg and which began on the 20th of January of this year.

X Q. 53. I repeat the question and ask you to answer it.

A. I repeat that I did not say Mr. Garrison showed me the piece of expanded metal.

X Q. 54. How soon after you had a talk with Mr. Garrison about the piece of expanded metal in question did you visit Crab Creek?

A. I had conversations with Mr. Garrison in regard to the infringing metal, and I visited Crab Creek on the same day of my arrival in Pittsburg, for my conversation with him respecting this might have been after my visit to Crab Creek. I knew he had been to Youngstown and had seen the machine, and so stated to Mr. Kingsley as the reason why he should show me the machine.

X Q. 55. When was the meeting of the Expanded Metal Company in Pittsburg?

A. It began on the 20th of January, this year.

X Q. 56. Were you present at that meeting?

A. I was.

X Q. 57. Do you remember what date you arrived in Pittsburg?

A. On the evening of the 19th or morning of the 20th. It was the morning of the 20th.

X Q. 58. What made you change your answer, then?

A. Because I remember having come on the night train from New York.

Adjourned to 1:30 P. M.

Met after recess at 1:25. Present as before.

X Q. 59. Mr. Golding, did you ever see any machine owned by the General Fireproofing Company in operation making expanded metal like Exhibit 1?

A. I have never seen any machine in operation owned by the General Fireproofing Company.

X Q. 60. Have you any idea how many concerns there are in this country making diamond mesh expanded metal?

By Mr. MUNDAY: Objected to as outside of the direct examination.

41 A. So far as I know, there is only one other party other than the General Fireproofing Company making expanded metal diamond mesh of the kind related to in this patent in suit, excepting, of course, those licensed under my patents.

X Q. 61. You have declared that Exhibit 1 was made in a certain way, yet is it not possible that it might have been made by some other machine which did not simultaneously cut, stretch and bend the metal?

A. No machine could make this metal that did not cut it, no machine could make this metal that did not bend it, and the fact that the metal is stretched proved that it was made by a machine that did stretch it. Now it might be possible for a machine to slit the metal and by another process stretch the strand after it was cut, which would in effect bend it away from the plate from which it was made, but such operation would show marks upon the metal of a tool or tools in action just as Exhibit 1 shows the marks of the cutters which made it, and, as before explained, I first carried out this process with a chisel formed at its end in the shape of the cutters I now used in this present machine.

X Q. 62. In Fig. 3 of the patent in suit there are two cutters marked B and C. Please state which of these cutters corresponds to the chisel, as you have described your first experiments?

By Mr. Munday: Objected to as outside of the direct examination.

A. Part B, Fig. 3.

X Q. 63. Would an upper cutter B with a cutting edge shaped like the cutter in Fig. 2 of the patent in suit make a diamond mesh?

By Mr. Munday: Same objection.

A. It would make a mesh very similar to the mesh shown in Fig. 1.

X Q. 64. Would you call the mesh shown in Fig. 1 of said patent a diamond mesh?

42 A. It is what we term in commerce, a diamond mesh.

X Q. 65. I note that the points of the cutter B in Fig. 2 are squared off at *b* so that the resulting mesh is not an exact diamond. What would be produced if the edges of the cutters at *b* in Fig. 2 were round or substantially semi-circular?

A. Well, the expanded metal at that point would be in a curved line corresponding with the curved point of the cutter, provided the curved point was not too small. If it was too sharp the metal would be inclined to part, as the connection would be short.

X Q. 66. Did you ever use a round cutter such as I have referred to?

A. Our cutters or knives are usually rounded at the point to the right and left of *b*. We make the knives flatter on the points where we wish a longer connection left in the metal.

X Q. 67. How many different kinds of machines, Mr. Golding, have you ever seen or you know of that will make a product like Exhibit 7, Sample of Golding's Process Work?

A. There are several kinds of machines used by the Expanded

Metal Co., and, as previously stated, I know of one other machine besides the one I believed we used by the General Fireproofing Company.

X Q. 68. Will you state generally how the machines used by the licensees under your patent for making diamond mesh differ in the construction of the cutter or knives?

A. Well, the cutters are variously constructed, some made in one piece, some in two pieces and some have simply a vertical movement, while others have both a vertical and reciprocating side movement. Where there is reciprocating side movement in the knives, the metal is not shifted.

X Q. 69. You have referred on your direct examination to the use of a bed knife. Will you please explain what you mean

43 by bed knife, with particular reference to the patent in suit?

A. The bed knife on the patent infringed, dated October 9, 1894, is the part lettered C in Figs. 2 and 3.

X Q. 70. What is the function of this knife C?

A. It is to resist the action of cutters B in Figs. 2 and 3 when such cutters are passing over the face of C while in the act of cutting, stretching and bending the metal.

X Q. 71. Can you conceive of any substitute for the bed knife C in patent in suit?

A. Well, if you must know, I can tell you that I could leave *Figs.* B in a fixed position and could actuate C and C against it, as one means, and as another means B could be inverted and a hand tool and hammer could be used to force the metal over the corrugations of B. My answer is that it is evident that a piece of metal cannot be sheared without the use of more than one blade, no matter what the shape of the instrument may be.

X Q. 72. If the cutters shown in Fig. 2 of the patent in suit were turned upside down as you have stated they could be, and the machine operated, would you get the same result?

A. Exactly the same result, but the metal to be cut would have to be held flatwise against the underpart of C, providing C was inverted.

X Q. 73. In that case, which would you call the bed knife?

A. Well, the bed knife is generally referred to as that which is stationary.

X Q. 74. Which knife is stationary when the machine is reversed as described?

A. If B and C in Fig. 2 were reversed, C might be stationary or B might be stationary, whichever you chose.

X Q. 75. Suppose they both move, which would you call the bed knife?

44 A. It is not necessary to call either of them a bed knife. It is only a convenient term.

X Q. 76. As I understand it, to make diamond mesh like Exhibit 7, sample of Golding's process work, it is first necessary to have two knives which co-operate; and, second, one or the other must be moveable. Is that right?

A. Yes, so far as I know.

X Q. 77. Are you sure that you understand what is meant by a process which is the function of a machine?

A. I would say that I do not understand a process to be a necessary function of a machine. That is to say, I understand that a process as in the patent in question may be purely a mental conception or means of operating upon a piece of metal or other material in a way to produce some desired effect. In other words, it is a means of telling some one how to go about to do a thing. I understand the functions of a machine to be its parts constructed and moved in a manner to produce the desired effect upon some materials desired to be operated on or with.

By Mr. MUNDAY: Question and answer objected to as immaterial and incompetent and outside of the direct examination.

X Q. 78. I understand you to say then that it is your belief that the function of a machine may be said to be the effect produced by the parts of the machine upon the material operated upon. Am I correct?

By Mr. MUNDAY: Objected to as incompetent, immaterial and outside of the direct examination.

A. I do not gather the meaning of that.

X Q. 79. I refer you to the last sentence of your answer to Q. 77, and again ask you if my understanding of your definition is correct.

By Mr. MUNDAY: Objection repeated.

45 A. I cannot tell what your understanding is. You ask me if you are correct in your understanding. I cannot tell whether you are correct in your understanding or not.

X Q. 80. If you do not understand the meaning of X Q. 78 please say so.

A. I understand what you say, but I repeat that I do not understand what your understanding is.

X Q. 81. Is the function of a machine the effect produced by the parts of the machine upon the material operated upon?

A. The function of a machine is to produce the effects seen in the material operated upon or with.

X Q. 82. You stated in your answer to Q. 9 on direct examination that to produce an expanded metal structure like Exhibit 1 the plate must necessarily rest upon a straight bed knife. Have you any qualification to make to this answer in the light of your later testimony on cross-examination?

By Mr. MUNDAY: The question is objected to as containing an utter misstatement and misrepresentation of the testimony of the witness or a misunderstanding of the same. The witness did not testify "that to produce an expanded metal structure like Exhibit 1 the plate must necessarily rest upon a straight bed knife," but simply said "to produce such a cut and stretch of metal, the plate must necessarily rest upon a straight bed knife," having previously pointed out that the "cut" edges of the metal bear the marks of the cutter on the lines perpendicular to the plane of the sheet. Obviously, the structure shown in said Exhibit 1 might be made by a variety of mechanisms, though perhaps it would not show the marks of a straight bed knife unless such a knife was used.

By Mr. **Ogden**: Counsel for defendant is not aware that the counsel for complainant was on the stand testifying as a witness
in this cause and counsel for defendant protests against
46 objections to questions in the guise of an objection, which,
however, explain a question to the witness and suggest its answer.

A. I have said that either blade of the machine or knife might be moved and that a similar result could be obtained by the use of hand instruments, but they would not necessarily show the straight line back of either section of the meshes on the under side of the metal, as any rest at such point for cutting could be obviated.

X Q. 83. Why do you say it is obvious that because the strand seems to be stretched in Exhibit 1, that it must have been done simultaneously with the act of cutting?

A. Because of my intimate knowledge of the art, and the absence of any marks other than those caused by the pressure of the two cutters.

X Q. 84. If the metal was slit first and expanded afterwards, would it be necessary to use more than two cutters?

A. If it were slit first, it would be necessary to use some instrument of a different form than that which would simply slit the metal. The slit portion would have to be carried away from the plane of the uncut sheet to form the mesh and the strands would either have to be elongated by some drawing, hammering or rolling process.

X Q. 85. Who showed you the piece of expanded metal that you stated Mr. Garrison brought to the Pittsburg office?

A. Mr. Walter Chess, of the Central Expanded Metal Company of Pittsburg. His office was then next door to Mr. Garrison's.

X Q. 86. When did he show it to you?

A. He showed it to me in January of this year.

X Q. 87. Before or after you had had a conversation with Mr. Garrison about said piece of metal?

A. It was before I had conversation with Mr. Garrison on that particular subject of the infringement.

47 X Q. 88. How did Mr. Chess get that piece of metal?

A. Mr. Chess stated to me that Mr. Garrison had brought it from Youngstown as an example of what the General Fireproofing Company were doing.

By Mr. **Ogden**: Answer is objected to as irresponsive.

X Q. 89. Did Mr. Chess tell you that Mr. Garrison had given him that piece of metal?

A. Yes, sir. Mr. Garrison himself talked very freely to me about the people of Youngstown infringing our patent and said it was going to create great competition.

X Q. 90. Which gentleman did you have a conversation with first, Mr. Chess or Mr. Garrison?

A. I made very frequent trips from New York to Pittsburg in the early part of this year, and, as their offices were adjoining to each other, I had frequent conversations with each of them, so much so that it would be impossible for me to tell whether I was first spoken to by Mr. Garrison or Mr. Chess personally as to the metal in question, but I had been apprised of it by correspondence prior to my knowledge that they were practicing our identical art.

X Q. 91. Isn't it possible that you may not have had a talk with Mr. Chess until after you returned from Crab Creek?

A. No, sir; the piece of metal in question was in our Pittsburg office prior to my visit to the office of the General Fireproofing Company at Crab Creek.

X Q. 92. You did not seem sure whether you had a talk with Mr. Garrison before or after your trip to Crab Creek; and if you are also not sure which of these two gentlemen, Mr. Chess or Mr. Garrison, you saw first, how are you able to fix your date of conversation with Mr. Chess?

A. I know that on the particular journey to Pittsburg referred to, that I first talked with Mr. Chess, as I had good reasons then to believe that Mr. Garrison was a party to the infringement
48 or was in close communication with the infringers in the business of selling expanded metal. I fix my conversation with Mr. Chess from the fact that we had a meeting of the Expanded Metal Co. at that time, which was the 20th of January.

X Q. 93. How long does it take to get by rail from Pittsburg to Youngstown?

A. About two hours and a half. Something of that sort, two hours or two and a half. We started from Pittsburg after noon and returned to Pittsburg the same evening.

X Q. 94. What time of day on January 20th was the meeting of the Expanded Metal Co. in Pittsburg?

A. We began about half-past nine in the morning.

X Q. 95. You seem to have been a pretty busy man on January 20, 1904. At what time on that day did you have your conversation with Mr. Chess?

A. I was at the office the first thing in the morning and met him early, probably as early as nine o'clock.

X Q. 96. Then, I suppose you attended the meeting at 9:30 on the same day?

A. Yes, sir.

X Q. 97. Did not have a very long conversation with Mr. Chess, did you?

A. Well, I did not do all the talking; there were others there. I had frequent talks with Mr. Chess as well as with others present.

X Q. 98. Was Mr. Garrison at the meeting or in the ante-room?

A. He was not at the meeting, and he might have been in the ante-room, so far as I know.

X Q. 99. Did you see Mr. Garrison on January 20th at all?

A. I did not have conversation with him at all, as far as I remember.

X Q. 100. How did you happen to make a difference of a month in the date you first stated as that upon which you visited Crab Creek?

49 A. Because, in the first place, I did not remember the date of the meeting, and requested Mr. Bradford to refer to some correspondence that I had with him, and he by error gave me dates of correspondence in February. I became uncertain in my mind still as to this, and looked up my correspondence at hand, in this, Munday, Evarts & Adcock's office, and find that the meeting was on January 20th.

X Q. 101. Between whom is that correspondence?

A. Between myself and Munday, Evarts & Adcock.

X Q. 102. Will you please produce that correspondence?

A. The letter I produce is from myself to Mr. Evarts, and is dated January 19, 1904. Here it is.

X Q. 103. By an inspection of the letter you have handed me, I find that it is dated New York, January 19, 1904, purports to be a communication from you to Mr. Evarts. You refer to the meeting of the Expanded Metal Companies in Pittsburg. Is this the meeting which you state occurred on January 20, 1904?

A. Yes, sir; that is the meeting.

By Mr. Ogden: I ask that the notary mark this letter which I have here for identification as follows Letter of January 19th, 1904.

X Q. 104. Do you know when the bill was filed in this present suit?

A. I do not remember the date.

X Q. 105. Were you not advised by the attorneys after the bill had been filed?

A. I was advised by the president of our company when this bill was filed, but I don't remember what date it was.

X Q. 106. Did you come back to Youngstown or go straight to New York after your visit to Crab Creek?

A. I have already stated I returned to Pittsburg from Youngstown the same evening.

X Q. 107. When did you go back to New York?

50 A. We continued the meeting over the next day in Pittsburg.

X Q. 108. When did you leave Pittsburg?

A. I was in Pittsburg all the next day.

X Q. 109. When did you return to Pittsburg again?

A. As I stated before, I made so many trips back and forth to Pittsburg that I could not tell exactly when I returned to Pittsburg. I have been there a great many times this year.

X Q. 110. Where did your conversation with Mr. Garrison occur?

A. In his office, next door to the Central Expanded Metal Company.

X Q. 111. Can you fix the date as in either January or February, 1904.

A. I don't remember of ever going to Pittsburg that I did not call in at Mr. Garrison's office.

X Q. 112. You can't fix any particular date, then, that you had a conversation with him about the piece of expanded metal you saw in Pittsburg?

A. I would not undertake to fix a definite date, but he very freely talked with me about the infringing people at Crab Creek, the General Fireproofing Company, and I remember that this was prior to the time we actually commenced the suit which we were preparing to begin.

X Q. 113. Then, it might have been in February, 1904, that this conversation with Mr. Garrison took place?

A. I don't know what dates in February I was in Pittsburg, or if I was there at all in February. I would have to look up in my correspondence.

X Q. 114. What happened on February 20, 1904, that you have fixed that date in your mind?

A. I have already told you that it was an error brought about by Mr. Bradford's reference to some other correspondence between us.

X Q. 115. Was there a meeting of the Expanded Metal Companies on February 20th?

51 A. Not to my knowledge in Pittsburg. There was one about that time in New York.

X Q. 116. Is that the one that Mr. Bradford referred to?

A. Yes, sir; that is the one.

X Q. 117. Did you attend that meeting of the Expanded Metal Companies in New York?

A. Yes, I did.

X Q. 118. Did you go to Youngstown after the meeting in New York on February 20, 1904?

A. No, sir. I was only to Youngstown once during the last fifteen or twenty years.

X Q. 119. What became of the piece of expanded metal Mr. Chess showed you in Pittsburg?

A. I took it away with me and have it here, marked Expanded Metal, Complainant's Exhibit No. 5.

X Q. 120. Have you had it in your possession ever since?

A. Yes, sir.

X Q. 121. Did Mr. Chess give you this piece of metal?

A. He handed it to me and I took it.

X Q. 122. What proof have you that this piece of expanded metal, Exhibit 5, is the same one that Mr. Garrison, you state, brought from Crab Creek?

A. Mr. Garrison told me that he had been to the works at Crab Creek and we talked of this piece of metal, which he brought with him and said was just like ours. Mr. Garrison spoke of this piece of metal which he said he brought from Crab Creek.

X Q. 123. By what means did he identify this particular piece of expanded metal, Exhibit 5, as the piece which he himself brought from Crab Creek?

A. He would have no difficulty in identifying this piece for the reason that he is a member of the corporation handling large quantities of expanded metal, and such metal as they had heretofore handled which was made by Chess Bros., that is, the Central Ex-

52 panded Metal Company of Pittsburg, is annealed before it is sent out, and, therefore, is of a dark blue color, instead of a bright steel color, as is shown in the piece in question, Exhibit No. 5.

X Q. 124. How could he identify that particular piece, Exhibit 5, if you did not have it with you when you saw him?

A. He did not refer to any other piece that he had brought there. He did not speak of any other piece. I don't know how he would identify it any further excepting by the size. It is not customary to keep such sized pieces in the offices.

X Q. 125. You referred to an expanded metal made by the Central Expanded Metal Company of Pittsburg, and you have made a comparison between Exhibit 5 and the expanded metal of said company in regard to the size of the mesh. Can you produce a sample of the expanded metal made by said company?

A. There are two specimens already in evidence, Exhibits No. 7 and 8.

X Q. 126. Have any of your patents ever been in suit before?

By Mr. MUNDAY: Objected to as immaterial and outside of the direct examination.

A. Yes.

X Q. 127. Which one?

A. There was a suit brought under my first patent.

X Q. 128. Do you refer to United States patent No. 297,382, which I show you?

A. I do.

X Q. 129. Was suit ever brought on this patent No. 297,382 against the board of education of St. Louis?

By Mr. MUNDAY: Objected to as not calling for the best evidence. The case referred to is recorded in the books, if it ever was decided, and there is a record of it in the court, which is the best evidence.

A. Yes.

53 X Q. 130. As Mr. Munday correctly says, the case referred to is reported in 103 Fed., 287, and on appeal in 111 Fed., 395, and I wish to ask you if you remember how the case was decided on appeal?

By Mr. MUNDAY: Objected to as not the best evidence and inadmissible unless it is intended to test the witness' recollection, in which case it is not a proper test.

A. I do not remember the full language of the decision, but it is my recollection that the court held that the goods complained of as infringing my original patent did not infringe.

X Q. 131. Do you remember whether or not the patent was held to be valid on appeal?

By Mr. MUNDAY: Objected to as improper.

A. I do not remember that the court declared my patent invalid, and I would further state that it was not a matter of much moment to us at the time of the final decision, as the patent had expired or was about to expire, and, further than this, I would say that during the whole of the time of this litigation I was not in the United States.

X Q. 132. Did you testify in that suit?

A. I did not

X Q. 133. Did you ever see or hear of a British provisional specification granted to a man by the name of Thomas Long in 1862, No. 2,125, for the manufacture of open metal work?

By Mr. MUNDAY: Objected to as outside of the direct examination.

A. I have heard of it and seen it printed in an old Patent Office report, which was some years after I had invented and patented expanded metal.

X Q. 134. As you do not seem to remember, I will state for your information that your original patent No. 297,382 was held to be anticipated by the Circuit Court of Appeals, by said British provisional specification. I find in your answer to Q. 6 on direct examination that you say, "I first invented the original expanded metal as shown in my patent," and you have identified the patent 54 you mean as No. 297,382. In view of the court decision of record, can you claim to be the inventor of the original expanded metal?

A. I repeat my answer as given in answer to Q. 6, and wish to state that the metal as shown in my original patent referred to was not shown by any drawing whatever in the Long patent and that there is nothing in the Long patent to show that the cut edge of the metal were presented to the face of the expanded sheet. Further, it states that before the sheet was opened out, the loose cut ends are bent around a wire and that the metal is drawn open thereafter, which would produce an article entirely different from the expanded metal which I invented.

Adjourned to 10:30 A. M., August 19, 1904.

H. M. MUNDAY,
Notary Public.

Met August 19th at ten A. M., pursuant to adjournment.
Present as before.

X Q. 135. Mr. Golding, in your answer to X Q. 83 you referred to your "intimate knowledge of the art." I wish to ask you if your answer to Q. 24 on direct examination relative to the alleged advantages of your diamond mesh was given with reference to the prior art?

By Mr. MUNDAY: Objected to because the question contains a misstatement of the testimony. The answer to X Q. 83 speaks of the "art," not the *prior* art. There is no objection to the witness stating whether or not he had any comparison in mind in stating the advantages of his process and his product. But this witness was not asked anything about the prior art on direct examination, and objection is made to any cross-examination concerning said prior art.

By Mr. Ogden: Counsel for defendant again protests
55 against an objection which is entered in the guise of an objection, but which explains the question and instructs the witness how to answer.

A. It certainly sets out the advantages of this process patent in question as an improvement over former methods.

X Q. 136. When you speak of former methods, you do not refer exclusively, do you, to your own patents?

A. Former methods known to me.

X Q. 137. Do these former methods include inventions of parties other than yourself, beside your own inventions?

By Mr. Munday: Objected to as outside of the direct examination.

A. They include all subjects known to me.

X Q. 138. Do you know of any inventions relating to expanded metal beside your own inventions?

By Mr. Munday: Objected to as outside of the direct examination.

A. I do.

X Q. 139. I refer you to lines 15 to 21 on page 1, in the patent in suit, in which reference is made to two prior patents, Nos. 381,230 and 381,231. It is true, is it not, that the machines disclosed in these two patents simultaneously cut and open the metal?

By Mr. Munday: Objected to as improper cross-examination and outside of the direct.

A. Yes. One machine particularly describes the method of making expanded metal and the other relates to the method of feeding the metal, etc., and, as stated, they both made expanded metal which when made was shorter than the plate from which it was made because the machines did not stretch the metal. That is, the opening of the metal was not dependent upon the stretch of the metal. I think it would be proper for me to illustrate the difference between the two machines last referred to and the process patent in question in this suit by parts of a machine which I have present. (Witness refers to parts of machine he has present.) The two cutters
56 mounted on a wooden base in the model submitted are cutters which have been a long time in use by the Northwestern Expanded Metal Company at Chicago, and have been ground down on their faces till they are quite thin. We term these the lower cutters in the machine. The two loose cutters are termed upper cutters. By taking these two loose cutters in hand and placing their broad faces against the broad faces of the under cutters, and then lifting them vertically to a point somewhat above the under cutters. The under cutters will then be in position to return to a point where the upper cutters first act upon the metal. This can be further and more clearly illustrated by placing two round lead pencils upon a flat table and placing the wooden model upon them and on or about

the lines shown by nicks on either side of the base of wooden model. These lines are parallel with the stocks of the cutters and are directly at right angles to the line drawn across the face of the cutters. By moving the wooden model in the direction of the arrow shown on recess face of wooden model to a distance of about one and three-quarter inches, they will be in position for the upper cutters to act upon a piece of metal which it is desired to be cut and simultaneously opened. This is done as may be seen by placing a piece of paper into which a slit has already been made and allowing the upper cutters to be passed downward on a vertical line. It will be seen that the paper opens up and that as the lower cutters recede by the pressure imposed upon the narrow face of one of them by one of the upper cutters, that the paper has opened in the form of a diamond mesh without being in the least stretched. The object of constructing the lower knives so that they will recede in the movement before described is that there may be room for the upper cutters to pass down and form the metal over the lower cutters without requiring the metal being cut and opened to be strained or stretched. A piece of expanded metal having its meshes in step form left onto
57 a diagonal strip is the product of such cutters and their operation, as I have just described.

By Mr. Ogden: The whole answer, with the exception of the first word, "yes," is objected to as irresponsive and volunteered, and, since certain models have been referred to, their production in evidence is called for.

The wooden based model produced by the witness is introduced in evidence as Complainant's Exhibit No. 9, two loose cutters produced by the witness are introduced in evidence as Complainant's Exhibits No. 10 and the sample of expanded metal produced by the witness *are* introduced in evidence, marked Complainant's Exhibit No. 11. And these exhibits are marked by the notary. I certify that they have been so marked.

H. M. MUNDAY,
Notary Public.

X Q. 140. In your last answer you have stated that in the operation of a machine made like Exhibits 9 and 10 the sheet metal is opened without being in the least stretched, but in the patent in suit, in lines 23, 24 and 25 of page 1, when referring to a like machine, constructed in accordance with United States patents 381,230 and 381,231, the specification states "but *practically* no stretching or elongation of the metal forming the strands is caused." If practically no stretching is caused, there must necessarily be some stretching of the strands. What have you to say on the subject?

By Mr. Evarts: Objected to as not being in the direct examination.

A. Answering the first part of your question, you will find in my answer on page 42, line 12, that I was not speaking of metal not being stretched in the least; that my statement, to repeat, was "and

that the paper has opened in the form of a diamond mesh without being in the least stretched." On the fourth line following this, I quote again, the words "without requiring the metal being
58 cut and opened to be strained or stretched." Now, what I mean by these words and in answer to your question as to whether there must be some stretching, I aver that it is a well known fact that to shear two parts of the metal asunder, will cause them to slightly elongate, but the meaning of practically no stretching as referred to in line 24 of the specification of patent No. 527,242, is that the opening of the mesh was in no way dependent upon the stretching of the metal.

X Q. 141. Then, although the opening of the mesh in Exhibit No. 11 is done simultaneously with the cutting, there is necessarily some stretching of the strands, is there not?

Objected to as immaterial and not relating to the direct.

A. I have explained already that the act of severing two pieces of metal apart necessarily causes them to elongate on the cut edges. But to further illustrate how little strain or stretch there may be upon metal operated on by a machine such as is exhibited by the model submitted, I can say that when the cutters, both bottom and top, are sharp, that tissue paper can be cut and opened in the form as shown in the sample of expanded metal as made by such cutter, and it is well known that there is very little ability in a piece of thin paper to stretch. In other words, this enables any one to judge as to how little the opening of the metal by the machine under patent No. 381,230 and No. 381,231 are dependent upon any stretching of the metal.

X Q. 142. Then, the amount of stretch in the strands of Exhibit 7, Sample of Golding's Process Work, and Exhibit No. 11, made by a machine like that of patents 381,230 and 381,231, is really a difference in degree; that is to say, the strands of Exhibit 7 are stretched more than the strands of Exhibit 11, are they not?

Question objected to for the reasons above given; also because it calls for the opinion of the witness on a question of patent
59 law. It does not appear that the witness understands what the question means by a difference of degree.

A. Your assumption is wholly incorrect, as the process, method or act of producing the two articles are entirely different. The one, Exhibit No. 11, as I have already explained, does not depend upon the stretch of the metal for opening the mesh, whereas the opening of the mesh in Exhibit No. 7-8 are dependent entirely upon the stretch of the strand forming first one side of the mesh and then by a similar act the balance of the mesh is formed. The form and shape of the cutter making such half diamond meshes as I have described are similar to a wooden model which I now submit and which will be found to fit into the half meshes next to the uncut metal.

The model produced by the witness is introduced in evidence as Complainant's Exhibit No. 12.

I certify that I have marked said exhibit.

H. M. MUNDAY,
Notary Public.

The cutters as illustrated by the wooden model cutter marked Exhibit 12 reciprocate vertically as indicated by the arrow on one face of the wooden model, and, as stated in my prior evidence, they may also have a side reciprocal movement to avoid the necessity of shifting the sheet of metal.

X Q. 143. Which strands are stretched most, those in Exhibit 8 or those in Exhibit No. 11?

A. In No. 8 they are stretched as described and in No. 11 there is only such stretching as is incident to the slitting of the metal.

X Q. 144. Then, there is not as much stretching in the strands of Exhibit 11 as there are in Exhibit 8?

A. I have repeatedly and most fully answered as to this question of stretching in both No. 8 and No. 11.

X Q. 145. What do you consider the new features of your alleged process as covered by the patent in suit?

Objected to, as the patent speaks for itself.

A. That is fully described in the specification and claims of my patent in suit.

X Q. 146. The patent in suit, on page 1, lines 29 to 33, states that: "the invention consists in the improved method of making expanded metal, viz.: by simultaneously cutting and opening or expanding the metal at the cuts by stretching the severed portions."

Do you consider that to be a fair statement of the gist of the invention?

A. I do, with the exception that there might have been added the words "between the uncut portions of the metal," but which is referred to, however, in other parts of the specification and shown in the drawing. This I believe to be the only known method whereby metal is cut and opened away from the plane of the uncut metal and still having the cut and stretched portion remaining intact with the uncut metal.

X Q. 147. It was old, was it not, before you applied for the patent in suit, to simultaneously cut and open or expand the metal at the cuts to form expanded metal?

A. That can be seen in the Patent Office records, and I do not assume that you are asking for information outside of such record.

X Q. 148. Before you applied for the patent in suit you had already made expanded metal by simultaneously cutting and opening or expanding the metal, had you not, as evidenced in your prior patents?

A. Yes.

X Q. 149. Then, you consider that the new feature of your alleged invention disclosed in the patent in suit consists in stretching the severed portions of the metal between the uncut portions of the metal, do you not?

A. Yes, to the full extent of forming the half of the mesh and
again by the following act, the other half of the mesh by
61 cutting, bending and stretching as described in the patent.

X Q. 150. Before you applied for the patent in suit you yourself knew it to be old, did you not, to cut and open metal and at the same time stretch the severed portion, or was this an absolutely new feature to you?

A. The fact that the metal could be stretched in the manner described in my patent was new to me, and as further evidence of the novelty of expanded metal so made, we did in the early stages of the production of this process metal in question, submit samples of it to numerous mechanical engineers with the request for them to state how it was made, but none were able to tell until it was explained or a piece of the uncut metal and the cut and stretched metal together were shown to them. That is, when told that the sample shown to them without the strip on was of the same length as the plate from which it was made.

X Q. 151. You have already stated on cross-examination that your answer to Q. 24 on direct examination sets out the advantages of this process patent in question as an improvement over former methods, the process patent in question being the patent in suit. I now ask you to look at United States patent No. 475,700, granted May 24, 1892, to George A. Ohl, and referring to Figs. 10 and 11 of said patent, will you please state whether or not the portions S' of the metal lathing there shown, are stretched between their points of attachment to the metal sheet?

By Mr. MUNDAY: Objected to as outside of the direct examination, and it is suggested to counsel that he is making the witness his own, as well as very improperly exceeding his rights as a cross-examiner.

By Mr. OGDEN: This question in regard to the Ohl patent No. 475,700 is believed to be perfectly proper on cross-examination, be-
cause the witness has himself admitted that at least one of
62 his answers referred to former methods. Patent No. 475,700
is shown the witness as an example of a metal lathing which
was patented in 1892.

By Mr. MUNDAY: Argument of this matter is reserved for the court; it is not even known that the gentleman who makes this preceding argument is a member of the bar.

A. The patent of G. A. Ohl submitted to me is not and does not claim to relate to the making of expanded metal. It simply tells how to cut and force parts of a sheet away from its plane so as to form loops for holding plaster. The intersections immediately between any two loops is not in any way affected by the production of other loops in the sheet of metal operated upon and the article made is clearly confined for use as lathing and possesses none of the elements of open and reticulated metal work as illustrated by the patent in suit.

X Q. 152. Are or are not the strands S' in Fig. 11 of the Ohl patent No. 475,700 stretched, between their points attached to the metal plate?

By Mr. Munday: Objection repeated.

A. The parts pushed down from the plane of the sheet and which we term strands are set out in this patent of Ohl's as being stretched. They are not strands which form reticulated metal work. It is rather that which is not forced away from the plane which might be called strands, as it is those parts which would hold the sheet together even in case the stretched parts were disrupted, which is quite the reverse from expanded metal.

X Q. 153. In the Ohl patent No. 475,700, rotary cutters appear to be used. Please state what the effect of these cutters and the metal operated upon.

By Mr. Munday: Objection repeated.

A. It will shorten my answer to state that the specification fully describes the operation and effect of the action of such rolls upon metal.

63 X Q. 154. In the Ohl patent No. 475,700, what causes the stretching of the portions of metal S^1 in the figures?

By Mr. Munday: Objection repeated.

A. It is the cutters which extend outward from the rolls and passing between parts of another roll which forms the loops.

X Q. 155. I refer you to your patent No. 320,242, granted June 16, 1885, and ask you if the expanded metal there shown in the figure is meant to be the same as Exhibit 11?

By Mr. Munday: Objected to as outside of the direct examination and improper cross-examination; and further objected to as immaterial.

A. It is. The drawing in the case of the patent submitted represents the cutting as it actually begins at one corner and side of the sheet. The exhibit No. 11 is taken from the opposite side of the sheet. I only state this to show the difference in appearance of the drawing and the sample.

X Q. 156. I wish you would explain the following passage in patent No. 320,242, granted to you, said passage being found in lines 51 to 58, as follows:

"It is evident that the meshes could not be cut and simultaneously formed if the cuts were made in a single direct line across the metal, for the reason that as the meshes are made the article which they form is contracted to a length less than the original length of the metal from which it is cut."

By Mr. Munday: Objected to as outside of the direct examination and as palpably gross abuse of the cross-examiner's privilege.

A. This distinctly proves that the art of cutting, bending and stretching the metal by cuts made in a straight line for the purpose of forming a series of meshes, was unknown at the time this specification was written. And the quotation submitted by defendant's

counsel shows that it was understood that the shortening of
64 the sheet was essential to provide the metal necessary to go
around each mesh.

X Q. 157. At the time that the above quotation was written, as you say, which from the filing date of the patent appears to be in 1884, did you believe it possible that a machine could be constructed which would cut and simultaneously form the meshes as referred to in said quotation?

By Mr. MUNDAY: Objected to because the quotation obviously states that the "meshes could not be cut and simultaneously formed," and the question is a misstatement.

A. Yes, I did believe that such a machine could be constructed. I believed this to the extent that I made an effort to invent such a machine for such a purpose.

X Q. 158. Do you say that at that time, in 1884, you believed that such a machine might be made in spite of what is contained in the quotation referred to?

By Mr. MUNDAY: Objection repeated.

A. I understand the quotation as referred to is the description of a process wherein the cuts are not made in a straight line with their uncut connections left a part of the original sheet, but confined to an operation upon metal in step form as shown by the cuts and openings in the drawing of the patent submitted. The difference between cuts made in a straight line and the step formed as illustrated in the patent refers to cuts being made in a straight line along one edge of the sheet and opened down from such straight lines in contrast to the step form which gave freedom to that part which it cut and to allow the cut parts to be deployed away from the plane of the metal, instead of stretched away from the plane of the metal, as I afterwards discovered could be done.

X Q. 159. If the cuts were made in a single direct line across the metal, instead of as shown in the drawing of patent No. 320,242,
the article formed would not be contracted to a length less
65 than the original length of the metal from which it is cut,
would it?

Mr. MUNDAY: Objection repeated.

A. The length of the finished article would not be materially different from the plate from which it is cut if produced according to the method of my patent in suit.

X Q. 160. Then, you had in mind, did you not, when the above quotation from patent No. 320,242 was written, a structure like Exhibit 8, did you not?

Mr. MUNDAY: Objection repeated.

A. At that time I had no idea what a structure made by cutting from a straight line would look like, as I had not made it and did not believe it was possible to do so as described in the quotation from the patent submitted by defendant's counsel shows.

X Q. 161. Did you find much difficulty in making a machine to cut and simultaneously form the meshes, by making the cuts in a single direct line across the metal? I refer to the efforts you said you made to invent such a machine in 1884 as evidenced by your answers to X Qs. 157 and 158.

A. Such assumption is not contemplated in my answer to your interrogatory 157. But I have answered fully the same thing by my reply to your interrogatory 158. I want to add that X Q. 157 does not mention cuts being made in a straight line along one edge of the sheet of metal.

By Mr. OGDEN: The answer is objected to as not responsive, and counsel for defendant, although he much regrets to be obliged to do so, feels that he must enter a protest on the record against the remarks which have from time to time been addressed to the witness by the counsel for complainant. Counsel for defendant feels that he should be at liberty to cross-examine the witness without any instructions being given to the witness by witness' counsel.

66 By Mr. MUNDAY: Counsel for defendant states to the witness that it was his intention to mislead him in asking X Q. 161.

By Mr. OGDEN: Counsel for defendant regrets that if in a moment of heat he let slip the statement that X Q. 161 was intended to mislead the witness, because he now states upon the record that it was his honest belief that the answer to X Q. 157 was open to the construction put upon it by counsel for defendant in X Q. 161. With this explanation, it is trusted that the matter is closed.

By Mr. MUNDAY: I hope you will not do it any more, and please do not accuse me of trying to guide the witness when I was simply trying to prevent him from being deceived by calling his special attention to the nature of the question.

Adjourned for recess till 2:30 P. M.

X Q. 162. I refer to your answer to X Q. 152. Will you please describe a little more fully what you mean by reticulated metal work?

A. Well, reticulated is a dictionary word and is applied to expanded metal. It relates to the lattice-like appearance of the metal, but, not being latticed, that is, not being crossed, is not properly described as lattice work.

X Q. 163. Suppose the strips S¹ in the Ohl patent No. 475,700 were arranged very close together or side by side when the sheet is cut. Can you state what sort of a structure would be produced?

A. If the cutters which produce the loops were placed side by side, and metal passed between a roll containing such cutters, and another roll with recesses to fit into the uncut part between the loops longitudinally, the whole sheet would be cut into as many strips as there are cutters in width. If the loops were placed along one edge of the metal and the next series of loops made at the rear of these and opposite the uncut section, it would then be following the process
67 described in my process patent. It is not a difference in the shape of the cutter which makes the loop, but it is the fact

that in my process patent in question, the loops, that is, half the diamond mesh, are cut, stretched and bent down along the edge of the sheet and again cut, stretched and bent down at a point opposite to the intersection of the strand first formed.

It is hereby stipulated and agreed by and between counsel that the exhibits offered in evidence herein may be retained by counsel until the hearing, subject to production at any time on demand.

By Mr. Ogden: Mr. Evarts, will you consent to this?

By Mr. Evarts: Yes, I do.

By Mr. Ogden: Copies of the following patents which have been referred to in the examination of this witness are hereby offered in evidence:

United States patents Nos:
297,382, J. F. Golding, April 22, 1884.
320,242, Golding & Durkee, June 16, 1885.
381,230, Golding & Durkee, April 17, 1888.
381,231, J. F. Golding, April 17, 1888.
591,713, J. F. Golding, May 4, 1897.
475,700, G. A. Ohl, May 24, 1892.
British provisional specification, Thomas Long, No. 2,125, July 26, 1862.

And the same are marked by the notary Exhibit 13.

Cross-examination closed.

By. Mr. Evarts: Complainant's counsel objects to the patent copies just offered in evidence by defendant's counsel as being immaterial to the issue and as not relating to direct examination.

(Signed) JOHN F. GOLDING.

By Mr. Evarts: I desire to call the attention of defendant's counsel and to state on the record, that upon his arrival here on the 17th instant to attend under the notice given to defendant's counsel in New York, we gave you verbal notice that we desired to take the testimony of William H. Moody, who lives at Pittsburg, in the State of Pennsylvania, and whose name does not appear upon said notice for the reason that neither counsel nor complainant knew at the time the notice was given that the witness could and would testify to material facts. We now present this witness and ask that he be sworn in the cause and his deposition taken in the same manner as though his name had been properly inserted in said notice. 68

By Mr. Ogden: I wish to state that I now appear specially for the examination of this witness and I will remain for his cross-examination and I will cross-examine him *de bene esse*.

And thereupon, WILLIAM H. MOODY, being duly sworn, in response to direct interrogatories propounded to him by Mr. Edward S. Evarts, testified as follows:

Q. 1. What is your name, age, residence and occupation?

A. William H. Moody; age thirty-four years; residence, Braddock, near Pittsburg, Pennsylvania; occupation, assistant superintendent of the Central Expanded Metal Company at the factory. They make expanded metal.

Q. 2. Do you know the defendant corporation, the General Fireproofing Company, and have you ever been at its factory in Crab Creek, near Youngstown, Ohio?

A. I know of them, and I have been at their factory.

Q. 3. How many times did you go there, and when?

A. I was there first on February 9th of this year; also on the 10th and 11th of the same month. I was there on the 12th of the present month, also.

69 Q. 4. What was your purpose or object in going to the defendant's factory?

A. I was directed by Mr. Chess to go to Crab Creek and see the machine, if possible, and to see if it was exactly the same as ours, and the product it made.

Q. 5. State what you saw at the defendant's factory at the time of your first visit.

A. I was in the factory and saw the machine for making three inch mesh expanded metal.

Q. 6. Did you examine the machine at that time?

A. Yes, sir; I did.

Q. 7. State what you saw.

A. I found the machine similar to ours or the one operated by the Central Expanded Metal Company, only this machine was laid over on its back. I stepped around to one end of the machine and looked up and saw the knives and found them to be exactly similar to ours, having angular knives for top knives and a straight bed knife.

Q. 8. In what direction was the machine adapted to feed the sheet?

A. The sheets were held perpendicular.

Q. 9. Were they fed in the same direction?

A. Yes, they dropped down as fed.

Q. 10. In what direction did the movable knife move?

A. Horizontally.

Q. 11. Was the machine running at that time?

A. No, sir; it wasn't.

Q. 12. Did you see any three inch mesh expanded metal at the factory at that time?

A. Yes, sir; I did. I saw considerable of it lying around, and about fifteen sheets right at the discharge side of the machine, which Mr. Boothhart, I think that is his name, who, I was informed by one of the men, was the foreman, he told us that this expanded metal was produced on this machine.

Q. 13. Did you make any note of the length of the sheets?

70 A. Yes, sir; I did. I laid my rule on one of the diamonds and found it to be six and a quarter inches from center to

center, measuring lengthway of the diamond. I then counted the diamonds and found there were twenty, lengthwise of the sheet. That would make the sheet about ten feet five.

Q. 14. Were the sheets cut entirely up?

A. At that time I could not see whether they were or not. All I could see was the finished material.

Q. 15. Now please state what you saw at the time of your visit to the defendant's factory last week.

A. I saw the machine in operation, saw it producing expanded metal, counted the strokes of the machine and watched it making eight sheets. Saw the scrap taken out with a strip about three inches wide and as long as the original plate fed in. I stayed to see them put another sheet in and then left the works.

Q. 16. The machine you have just mentioned, was it the same or a different machine from the one you first saw?

A. It was the same machine and in the same place.

Q. 17. Did you notice how long the sheets were before they were put into the machine?

A. I did, but I had no chance to measure them.

Q. 18. How did they compare in length with the length of the expanded sheets?

A. As far as I could see, they were exactly similar.

Q. 19. How wide were the sheets of the expanded metal?

A. The sheets I saw it make were twenty-five cuts, and, being acquainted with the expanded metal production, I know it to be three feet.

Q. 20. Look at the example of expanded metal marked Complainant's Exhibit No. 1, Sample of Defendant's expanded metal manufacture, and state whether or not the product you saw at the Crab Creek factory was like unto or different from it.

A. It was the same.

71 Q. 21. State whether it is like unto or different from the expanded metal which you saw at each of your visits to the defendant's factory.

A. Yes, sir; it was just the same.

Q. 22. Can you tell from your inspection of this sample and from your experience in the manufacture of expanded metal by what process it was made?

A. Yes, sir; I can.

By Mr. Ogden: Question and answer objected to as calling for the mere opinion of the witness and because he has not shown himself qualified to express any opinions in regard to the manufacture of expanded metal.

Q. 23. Does the Central Expanded Metal Company make any expanded metal similar to the one which I have just shown you?

A. Lots of it.

Q. 24. How long have they been making it, if you know?

A. I can't exactly recall how long, but I am positive it has been ever since 1891 that they have been making expanded metal. I know this because this was the year I was sent to Rankin to assist

Mr. Chess, and I was there all the time the experiments were being made before the machine was procured to make expanded metal like this. Witness refers to sample No. 1, to which his attention has already been called.

Q. 25. What was the style of the concern with which you were engaged at that time?

A. Chess Brothers.

Q. 26. Do you remember from where the Chess Brothers secured their machine for making expanded metal like Sample No. 1?

A. Yes, sir, I do. They got it from the Lewis Foundry Machine Company, Pittsburg.

Q. 27. How long after 1891 was it that Chess Bros. began to make metal like Sample No. 1?

A. About five years, 1896. I know this to be a fact because we call it our 96 machine.

72 Q. 28. In your answer to Qs. 23 and 24 you state that the Central Expanded metal Company has been making expanded metal similar to this Sample No. 1 ever since 1891.

A. If I said that it was a mistake. What I intended to say and what I think I really did say was that we were making expanded metal not similar to this.

Q. 29. Please state whether or not this Sample No. 1 of open or reticulated metal work was or was not made by simultaneously slitting and bending portions of the plate or sheet of metal in such manner as to stretch or elongate the bars connecting the slit portions with the body of the sheet or plate?

By Mr. OGDEN: Question objected to as leading, and furthermore because it calls for mere opinion of the witness who has not shown himself qualified to express opinions in this matter, and also objected to because immaterial and irrelevant.

A. My experience with expanded metal, which dates back from the time we had the machine in 1896, which I superintended putting in the knives and all the different parts of the machine, stayed right with it, saw the production, corrected any defect in the sheet which I could see by the looks of the sheet, would show me by looking at this sheet that this is made exactly the same as ours, or rather the same as Mr. Evarts asked me.

Q. 30. Please describe briefly the manner in which metal similar to Sample No. 1 is made at your factory.

A. We take a sheet of metal, put it in between two traversing gauges, feed it in five thirty-seconds of an inch against gauges held in a holder, and then our machine comes down with angular moving knives, slits, bends and stretches it, forming one-half diamond mesh.
What we call the cutting jaw leaves the metal, the metal is
73 then traversed sidewise one-half the length of the diamond,
then fed in again five thirty-seconds of an inch, when the cutting jaw again comes down and cuts, bends and stretches the metal and forms another half diamond, and so on.

Q. 31. In your description, by the word jaw, do you mean the moving knife?

A. Not necessarily the moving knife, but what the moving knife is attached to.

Q. 32. Now state how this method of manufacturing metal like Sample No. 1 corresponds with or differs from the method which you saw in operation at the defendant's factory, leaving out of consideration the fact that the defendant's machine was turned on its back, as you express it, so that the sheet is fed vertically and the moving knives move horizontally.

By Mr. Ogden: Objected to as it has not been shown that witness ever saw the operation of any machine of the General Fireproofing Company to make the comparison called for, and furthermore objected to as calling for the mere opinion of the witness and as incompetent.

A. The expanded metal is manufactured similarly as the machine manufactures it at the Central Expanded Metal Company, with the exception that instead of traversing the sheet they traverse a part of the cutting jaw, which I suppose they term a holder.

By Mr. Ogden: This answer and all the questions and answers relating to comparisons between Exhibit 1 and the work done by the Expanded Metal Co. objected to because these questions assume facts not admitted. That is to say, they assume that the Expanded Metal Co. makes the product like Exhibit 1, which was not made by said company. Exhibit 8 should probably be substituted for Exhibit 1 in the questions and answers referred to, since Exhibit 8 was produced in evidence as a sample of the Expanded Metal Co.'s manufacture.

74 Q. 33. Is there among the samples before you any piece of expanded metal manufactured by the Central Expanded Metal Company and illustrating their product?

A. Yes, sir, there is. Exhibit No. 8 is a piece of expanded metal which was made under my direction.

By Mr. Ogden: The latter part of the answer is objected to as irresponsive and volunteered.

Q. 34. In the manufacture of this metal by your company, how does the length of the manufactured sheet compare with the length of the sheet before it is cut?

A. They are materially the same.

Q. 35. Have you any machines in your factory in which the knives are shifted sideways instead of the sheet?

A. Yes, sir, we have. We have three machines like this.

Q. 36. These shifting operations occur between the cutting operations, do they not?

A. They do. They occur while the cutting jaw is being lifted up and at the same time traversed.

Q. 37. Did you see them loading any cars with expanded metal like Sample No. 1 when you were at the defendant's factory?

A. I did.

Direct examination closed.

Cross-examination by Mr. Ogden:

X Q. 38. How long have you been with the Central Expanded Metal Company?

A. Ever since the Central Expanded Metal Company existed.

X Q. 39. About how many years has that been?

A. I don't recall how many years it has been, but I have been with Chess Brothers eighteen years. I was with them before they took up the manufacture of expanded metal.

75 X Q. 40. How are Chess Brothers related to the Central Expanded Metal Company?

A. They are the owners of it.

X Q. 41. In other words, the company went under a different name at first; is that so?

A. Yes, they did.

X Q. 42. How long have you been assistant superintendent of the company?

A. Since February 14, 1891.

X Q. 43. Did you take any letters with you when you went to Youngstown in February of this year?

A. I did not.

X Q. 44. How long did you say you were there in February?

A. February 9th, 10th and 11th. Only parts of days February 9th and 11th.

X Q. 45. Which day was it that you were in the factory?

A. February the 11th. No, February 10th, the second day I was there.

X Q. 46. Do you remember what day of the week this was?

A. No, sir, I do not.

X Q. 47. Do you remember what days of the week the 9th, 10th and 11th came on?

A. I don't remember now.

X Q. 48. Can't you remember what part of the week they came in?

A. No, I don't think I could.

X Q. 49. Do you remember whether Sunday intervened?

A. No, sir, I don't think so. I am pretty sure it didn't.

X Q. 50. When did you leave Youngstown after that visit?

A. On the morning of February 11th.

X Q. 51. What part of the day on February 10th was it that you were in the factory?

A. In the morning.

76 X Q. 52. About what time in the morning?

A. Our time is a little different from theirs. Do you want me to give it in Pittsburg time?

X Q. 53. I want you to give it in Youngstown time.

A. It was between the hours of 7 and 8.

X Q. 54. How many times were you in and out of the factory that morning?

A. Once.

X Q. 55. How did it happen that the machine was not running when you say you saw it?

A. I can't tell how it happened it was not running.

X Q. 56. Were workmen there at the time?

A. Yes, there were.

X Q. 57. Who gave you permission to inspect the machine?

A. Nobody, but before going in the shop we met two of their employés and asked them for their foreman. They told us that Mr. Booshart was the foreman, or a name similar to that; I don't recall it, and we would find him right inside of the building. We went in, walked over to the machine, stood there by the machine for a few minutes, when we were approached by another workman and asked us what we wanted. The young man I was with told him he was looking for a position. He went to get Mr. Booshart, who after a little time came and talked to us. I asked him then if he was making expanded metal on this machine. He told me they was. That was what the machine was for and if I would have used my eyes I could have seen it.

X Q. 58. What was the name of the young man you say you were with?

A. I refuse to answer.

X Q. 59. Do you know what his name was?

A. I refuse to answer that.

By Mr. Ogden: I appeal to Mr. Evarts, counsel for com-
77 plainant, whether or not the last question should not be an-
swered.

Mr. Evarts regards the last question as immaterial and supposes the witness desires to withhold the name because the young man referred to might be affected unfavorably in some manner if his name were disclosed.

X Q. 60. I will ask you once more if you will answer either of the last two questions, and if you will not, will you give any good and sufficient reasons why you should not?

A. I absolutely refuse to give the young man's name, for the reason that I do not see what bearing it would have on this case at all. I promised him faithfully I wouldn't and I won't do it unless I have to.

By Mr. Ogden: Since the witness will not answer the two cross-questions Nos. 58 and 59, notice is hereby given to complainant's counsel that in due time application will be made to the court for an order compelling the witness to answer the questions, unless they are answered before the witness leaves the stand.

X Q. 61. Did this man also see the machine when you saw it?

A. I can't say whether he did or not.

X Q. 62. Was he with you when you say you saw it?

A. Yes, sir, he was.

X Q. 63. Please refer to your answer to Q. 7 on direct examination and state where you stood relatively to the machine when you saw the knives?

A. I really can't explain how. If I would go in their factory and go right along to the inner edge of the machine and go down to the far edge of the discharge side, then look up into the space where the sheet is discharged, that is the place I stood to see the top knives.

X Q. 64. What do you mean by looking up; were the knives above the head?

78 A. They were, because when I saw the knives I was in a stooping position.

X Q. 65. Which of the knives that you saw do you refer to as a straight bed knife?

A. The one which was bolted to what we call the anvil.

X Q. 66. Which do you refer to as the top knives?

A. I referred to the top knives in a former answer of mine which should have been the moving knives. We always term them the top knives because they are the top knives of our machine. In answer to your question, the moving knives are the angular knives which cut, bend and stretch the metal.

X Q. 67. Could you see the knives without stooping down?

A. I could not.

X Q. 68. Then if the machine had been in operation you could not have seen the knives at work, could you, unless you had stooped down?

A. Do you mean from the position I was in at that time? If you do, I could not have.

X Q. 69. That is what I meant, and if you were standing up straight even in the same place that you were in the knives were not visible, were they?

A. No, sir.

X Q. 70. Could you see the knives from any other side of the machine?

A. If you mean from any other point of the machine, I would say yes.

X Q. 71. From what other point do you mean?

A. If I were to stand on the line of the bed knife, and saw the machine operating, I could have seen the moving knives.

X Q. 72. Could you have seen them without stooping down?

A. Yes, sir.

X Q. 73. How long were you in the shop on February 10th?

79 A. I cannot say. I didn't take any notice of the time. My object was seeing the machine and seeing as much as possible.

X Q. 74. Were you there half an hour?

A. I could not say, as I have already told you.

X Q. 75. Can't you state approximately how long you were there?

A. I cannot say how long I was there, but I hardly think I was there half an hour.

X Q. 76. Who told you to leave the shop?

A. Nobody.

X Q. 77. How far is it approximately from the entrance of the shop to the machine?

A. I guess about—do you mean from where we went in?

X Q. 78. Is there more than one entrance to the shop?

A. There are quite a few doors; I suppose they are entrances.

X Q. 79. Did you go in the main door or side door?

A. Really I do not know which is their main door or whether any of them is used as a main door. As on my last visit there I saw the workmen going in at several of the doors. Whether they went through any main door previously I do not know.

X Q. 80. How large is the shop room in which the machine is placed, approximately?

A. I would say about 60 by 100 feet, approximately.

X Q. 81. In about what position in the shop room is the machine, in the center or the side or where?

A. I would say about the center of the building on one side. That is, the side nearest the office.

X Q. 82. And away from the doors to the outside of the building. Is that so?

A. Yes, sir.

X Q. 83. Then it must be at least fifty feet, is it not, from any entrance doors to the machine?

80 A. I hardly think the machine is that far from the doors. I hardly think it is over twenty-five feet from the doors. That is, approximately.

X Q. 84. Did you have any conversation with Mr. Booshart on February 10th?

A. Only what I have previously stated.

X Q. 85. I refer to your answer to Q. 12 on direct examination and ask you if it was Mr. Booshart that talked to you?

A. Yes, he is the man.

X Q. 86. Who went with you last Friday, August 12, 1904, to see the machine?

A. The same party as on the previous visit.

X Q. 87. Are you willing now to disclose this young man's name?

A. If you show me what bearing that will have on the case, I will, and promise to protect the young man.

X Q. 88. What time of day was it on August 12th that you were at the shop?

A. I was in the vicinity of the shop the biggest part of the day. My instructions were to see the machine in operation and I was listening for the indicative sound which the machine makes which would thereby tell me that the machine was in operation. Until I heard this sound I stayed away some distance from the shop.

X Q. 89. What did they say to you when you tried to enter the door of the shop that they wouldn't let you?

A. It never took place. They never refused to let me in the shop at this time.

X Q. 90. What time do you mean by this time?

A. At the time I went to view the machine while it was operating.

X Q. 91. Do you mean on Friday, August 12, 1904?

A. I do.

81 X Q. 92. Were you permitted to enter the shop on that day?

A. I was not stopped.

X Q. 93. How did you get in?

A. Walked right in.

X Q. 94. How near to the machine were you while it was in operation on August 12th?

A. I should say about fifteen feet.

X Q. 95. Did you see Mr. Booshart that day, August 12th?

A. No, sir, I did not.

X Q. 96. Did you have any conversations with any one inside the shop?

A. No, sir. That is, on this visit you mean, August 12th.

X Q. 97. How did it happen that you did not get closer to the machine?

A. I have been working around expanded metal machines long enough to know that no person can be close to a machine and not be in the road.

Adjourned till 10 A. M., August 20th.

H. M. MUNDAY,
Notary Public.

Met August 20th at 10 A. M. pursuant to adjournment.
Present as before.

X. Q. 98. How long have you known Mr. J. F. Golding, who has just testified in this cause?

A. I have seen him at the works for quite a number of years, but I can't tell how long. It was before the firm took up the manufacture of expanded metal.

X Q. 99. Can't you state approximately how many years you have known him?

A. About fifteen years.

By Mr. MUNDAY: Objected to as outside of the direct examination.

X Q. 100. Where is Rankin?

By Mr. MUNDAY: Same objection.

82 A. Eight and seven-tenths miles from Pittsburg, I think.

X Q. 101. I refer you to your answers on direct examination to questions 23 and 24. What year were you sent to Rankin?

A. I answered that before. February 14, 1891.

X Q. 102. What were the experiments that were being made there?

A. These experiments were made long after that. I should judge about 1895. They consisted of taking one knife, shaping it angular shape, and another knife, bed knife, making a straight knife and placing it in one of our Bliss bunch machines, which has a vertical motion. Then operating it, making a half diamond, shifting the plate about one-half the length of the diamond, feeding the plate in the required width of the strand, then again punching down one-half diameter.

By Mr. **Munday**: Objected to as incompetent under the pleadings herein.

X Q. 103. Direct question 23 is as follows:

"Does the Central Expanded Metal Company make any expanded metal similar to the one which I have just shown you," and your answer was, "lots of it."

Did you understand which expanded metal was referred to in that question?

A. I understood the question all right, but I was merely taking you at your word, as you had previously stated that you did not care for the exact inches represented by the sample, and expanded metal made by the General Fireproofing Company and the Central Expanded Metal Company are identical, except in the length of the diamond.

X Q. 104. Previous to the time that direct question 23 was asked you, had I asked you any questions on the record?

A. You hadn't asked me, but you stated to Mr. Golding several times.

83 X Q. 105. State what to Mr. Golding?

A. You stated to Mr. Golding that you did not care for the exact number of inches or feet; that a lawyer did not care anything about that.

X Q. 106. In your answer to question 24 and in the first sentence, what kind of expanded metal did you refer to?

A. Like Exhibit 8.

X Q. 107. What kind of a machine did Chess Brothers first use to make this metal?

A. The same one they are using to-day.

X Q. 108. Did Mr. Golding before 1895 ever talk to you about expanded metal like Exhibit 8?

A. He did not, but he did to Mr. Chess and Mr. Chess had shown me some of the samples Mr. Golding had given him.

X Q. 109. Were those samples similar to Exhibit 8?

A. They were not exactly the same dimensions, but they showed the idea exactly. What could be done, only was on a smaller scale.

X Q. 110. Do you mean the meshes were smaller or the metal was thinner or both?

A. I have forgotten now; I couldn't say.

X Q. 111. Do you know how these samples which Mr. Chess had were made; were they made by hand or do you know how they were made?

A. I was given to understand that Mr. Golding had made them with a chisel in a vice.

X Q. 112. Do you know or did Mr. Chess ever tell you of experiments made by Mr. Golding in which a blade was made with several cutters fixed in an ordinary shearing machine which had a straight lower cutter so that the metal was expanded by operating the machine?

By Mr. **Munday**: Objected to as outside of the direct.

A. If I remember correctly, I was given to understand that that was the case.

84 X Q. 113. Do you remember when these experiments were said to have been made and about what year?

By Mr. MUNDAY: Objected to as incompetent and outside of the direct examination.

A. They were made previous to our experiments in 1895.

X Q. 114. I show you a copy of the patent in suit, Exhibit 3, from which you will see that the application for this patent was filed in the Patent Office May 7, 1894. Can you fix the date of Mr. Golding's work with the shearing machine and blade with several cutters with reference to the year 1894; was it before 1894?

By Mr. MUNDAY: Objected to as gross abuse of the cross-examiner's privileges, as outside of the direct examination and wholly immaterial.

A. I cannot. I was not present at Mr. Golding's experiments.

X Q. 115. How did you learn of them?

A. Mr. Chess told me about them.

X Q. 116. Do you remember in about what year he told you of them; was it after you went to Rankin?

By Mr. MUNDAY: Objected to as outside of the direct and incompetent.

A. It was.

X Q. 117. Did you ever see any of the expanded metal made with the shearing machine and the blade made with several small cutters?

By Mr. MUNDAY: Objected to as outside of the direct examination and immaterial.

A. I saw several samples, and Mr. Chess told me that some of them were made that way and called my attention particularly to the one made with the chisel.

X Q. 118. Do you know if there is an expanded metal company called the Northwestern Expanded Metal Company, with offices in Chicago?

By Mr. MUNDAY: Objected to as outside of the direct.

85 A. We have made several shipments to them.

X Q. 119. Do you remember when you first began to make shipments to them?

By Mr. MUNDAY: Same objection.

A. No, sir, I do not.

X Q. 120. Can you remember over about what period of years you have made shipments to them?

A. No, sir, I cannot.

X Q. 121. Have you ever been in their offices in Chicago on Twenty-sixth street?

By Mr. MUNDAY: Same objection.

A. If that is the street their office is on, I was there once.

X Q. 122. The place is No. 400 Twenty-sixth street, Chicago. Is that the office you refer to?

By Mr. MUNDAY: Same objection.

A. I do not know, as I was taken to their works by Mr. Bradford and cannot tell what street that is on.

X Q. 123. Did you go through the offices as well as the works?

By Mr. MUNDAY: Same objection, and further objection is made that the witness has not testified that he has gone through the works.

A. I did.

X Q. 124. You seem to have a pretty keen eye for observing, Mr. Moody. Did you notice that expanded metal is used for some of the cages around the clerks in the office?

By Mr. MUNDAY: Objected to as outside of the direct examination and as trivial.

A. Yes, sir.

X Q. 125. I don't suppose you know the cashier of the Northwestern Expanded Metal Company in Chicago, do you?

By Mr. MUNDAY: Objected to as outside of the direct examination and as immaterial.

A. I do not.

86 X Q. 126. Did anyone ever tell you or do you know how long certain portions or any portions of the expanded metal work forming the cages of the clerks in the Northwestern Expanded Metal Company in Chicago, which cages I understand you say you saw, has been used in the offices for caging?

By Mr. MUNDAY: Objected to as mere hearsay evidence which would not be competent for that reason; also objected to as outside of the direct examination, and further as incompetent under the pleadings.

A. No, sir.

X Q. 127. I suppose you noticed what kind of expanded metal was used for some of the cages at the Northwestern Company's office, did you not?

By Mr. MUNDAY: Objected to as outside of the direct examination and as immaterial and incompetent under the pleadings.

A. I did not.

X Q. 128. What do you mean by expanded metal when you use the term generally?

A. What the term implies. The metal has been cut and expanded.

X Q. 129. Do you mean stretched?

A. It would necessarily have to be cut and stretched to expand it.

X Q. 130. Are you now ready before you leave the stand to tell the name of the young man who was with you on your visit to Youngstown?

A. I have answered you repeatedly no. I will never divulge his name unless I am compelled to by the court.

X Q. 131. Is this young man who went to Youngstown with you in this country now or abroad?

A. I am unable to say.

X Q. 132. Where was he employed or what was the nature of his employment when he first went with you to Youngstown?

87 A. The same position he is now in.

X Q. 133. What is the nature of his employment?

A. Really I never saw him at work and could not tell you the nature of his employment.

X Q. 134. What line of business is he in?

A. Works in the mill.

X Q. 135. What do you mean, a rolling mill?

A. Yes, sir.

X Q. 136. Where is his home?

A. Youngstown.

X Q. 137. How old is he, about, do you know?

A. I do not know.

X Q. 138. Did you speak to any of the men in the shop when you were there on August 12, 1904?

A. No, sir.

X Q. 139. Do you know the names of any of the men you saw in the shop on that day?

A. No, sir.

Cross-examination closed.

Re-direct examination:

R. D. Q. 140. What kind of expanded metal was made at the Rankin Works prior to 1896; was it like Exhibit 8 or was it like Exhibit 10?

A. We didn't make either of these samples prior to 1896. We made expanded metal similar to Exhibit No. 10, and in the same — as Exhibit No. 10 was made, only the mesh is different.

R. D. Q. 141. Did your concern prior to 1896 make any expanded metal by the process by which Exhibit 8 was made?

A. No, sir, we did not. Only the few experimental samples we have made in 1895.

R. D. Q. 142. In answer to X Q. 91 you seem to state that the Central Expanded Metal Company has been making expanded metal like this Exhibit No. 8 ever since 1891. Did you mean to say that?

88 A. No, sir, I did not, nor do I think I said that.

R. D. Q. 143. It is the habit of the gentleman who asked you the question to mix up his questions, and he did so in this case by referring back to your answer to question 24. Can you state what you understood him to ask you in X Q. 91? Just state what you really meant to testify.

A. What I really meant to say, quoting my answer to Q. 24, "And I was there all the time the experiments was being made before the machine was procured to make expanded metal like this sample." I thought he meant at that time the expanded metal the machine was made to produce, as previous to that time we did not make expanded metal like Exhibit No. 8, but expanded metal similar to the process used in Exhibit No. 10.

R. D. Q. 144. Then you did not mean to testify that your company had made expanded metal like Exhibit 8 ever since 1891?

A. No, sir, I did not.

R. D. Q. 145. To clear up the history of your visits to Youngstown and to the factory at Crab Creek, I would like to have you state at what time you first visited Youngstown during this present year of 1904.

A. My first visit to Youngstown was on January the 17th, 1904. At this visit I did not visit Crab Creek, which is a few miles outside of Youngstown, which place I visited on February 9th, 10th and 11th, 1904, and August 12, 1904.

By Mr. OGDEN: Question and answer objected to as improper redirect examination.

R. D. Q. 146. State why you went to Youngstown January 17, 1904.

A. About a week previous to January 17, 1904, Mr. Chess came to Rankin with a sample of expanded metal like Exhibit 5, which he told me Mr. Garrison gave him and said it came from Youngstown. He asked me to go carefully over the sample and see if I

89 could find anything which we term "ear marks" which would

indicate that the plate or knives had been traversed. It was after this that he directed me to go to Youngstown and locate, if possible, the machine.

R. D. Q. 147. Did you locate the machine in Youngstown at that visit?

By Mr. OGDEN: This question and this whole line of examination, bringing in new matter, objected to as improper redirect examination.

A. No, sir; I did not.

R. D. Q. 148. In reply to X Q. 114, you say that the metal "would necessarily have to be cut and stretched to expand it." Did you refer to stretching the metal or stretching the sheet, or did you mean that expanded metal could only be made by stretching the metal itself?

A. What I understood by the question was, could expanded metal be made like Exhibit 8 without cutting, bending or stretching and I replied it necessarily must be cut and stretched to produce such sample.

R. D. Q. 149. Sample, Exhibit No. 10, is expanded metal, is it not?

A. Yes, sir; we term it that.

R. D. Q. 150. And it is a kind of expanded metal in which the sheet is stretched, but the metal itself is not stretched; is that right?

A. You mean the sheet is shortened. The sheet is shorter than the metal that is put in.

R. D. Q. 151. But the expanded metal is wider than the sheet, but not so long or longer than the sheet, but not so wide; that is to say, it is longer in one dimension and shorter in the other than the sheet from which it was made?

A. Yes, sir; that is it exactly.

By Mr. MUNDAY: This will close the complainant's case, excepting that the complainant reserves the right to introduce rebuttal testimony concerning matters which have been foisted into the record by complainant's counsel, notably the three patents to Golding, the two patents to Golding & Durkee, the patent to G. A. Ohl,
90 numbered, respectively, 297,382, 381,231, 591,713, 320,242, 381,230, 475,700, and the British provisional specification to Thomas Long, No. 2,125, of July 26, 1862, and all matters brought out in any manner concerning said patents or any of them, and all matters brought up on the cross-examination which were not referred to on the direct examination of the witnesses. When the defendant shall have notified complainant that defendant's testimony is closed, then complainant will take its said rebuttal testimony.

By Mr. OGDEN: Counsel for defendant reserves the right to all defenses and objections which may hereafter be made, any course pursued by counsel for complainant. Counsel for defendant asks counsel for complainant if he rests his *prima facie* case.

Counsel for complainant says he rests his *prima facie* case, excepting the right to rebut matters introduced by the defendant and which properly have been introduced by the defendant in its answering testimony and not upon this record. If the defendant takes no testimony, then complainant will take rebutting testimony to rebut the matters here offered by defendant in this record. If the defendant takes answering testimony, then the complainant will take rebutting testimony thereafter to rebut the things in this testimony as well as in the testimony taken hereafter. I may say, Mr. Ogden, that I protested against your putting these patents in the record and I shall take testimony concerning them, but I shall not take that testimony until after you have taken your testimony, if you shall take any testimony, or until after I learn that you will not take any testimony, if you conclude not to take testimony. Under these conditions, my *prima facic* case is closed.

(Signed) WILLIAM H. MOODY.

91 STATE OF ILLINOIS,
County of Cook, ss:

I, Harrison M. Munday, the above named notary public, do hereby certify that pursuant to the annexed notice issued and served in the above mentioned cause, wherein The Expanded Metal Co. is complainant and the General Fireproofing Company is defendant, and to the personal notice given to the counsel for the defendant, as appears of record herein, I was attended at the office of Munday, Evarts & Adcock, No. 204 Dearborn street, Chicago, Illinois, by John W. Munday, Esq., and Edward S. Evarts, Esq., of counsel for the said complainant, and also by H. G. Ogden, Jr., Esq., of counsel for said defendant, on the several days and dates hereinbefore stated; that the aforenamed witnesses, John F. Golding and William H. Moody, who were of sound mind and lawful age, were by me first carefully examined and cautioned, and duly sworn to testify the truth, the whole truth, and nothing but the truth, and they thereupon testified as above shown, and that the depositions of them subscribed as above set forth were reduced to writing by me and in the presence of the witnesses themselves, and from their statements, and were subscribed by said witnesses in my presence and were taken at the place in the annexed notice specified and at the times as set forth, adjournments being had or taken from day to day as provided in said notice; and that all was so done, written and signed in the presence of said counsel for said complainant and defendant. I further testify that the reason for taking said depositions was and is, and the fact was and is, that the deponent, John F. Golding, lives in the City of New York, in the State of New York, and the deponent, William H. 92 Moody, lives at Braddock, near the City of Pittsburg, in the State of Pennsylvania, both of which places of residence are more than one hundred miles from the place where the said suit is appointed by law to be tried; that I am neither of counsel nor attorney to either of the parties to said suit, nor interested in the event of said cause; and that, it being impracticable for me to deliver said depositions and the exhibits thereto attached with my own hand into the court for which they were taken, I have retained the same for the purpose of being sealed up and directed with my own hand, and speedily and safely transmitted to the said court for which it was taken and to remain under my seal until then opened.

As witness my hand and seal this 20th day of August, A. D. 1904.

[NOTARIAL SEAL.] HARRISON M. MUNDAY,
Notary Public.

My commission expires September 28, 1906.

93 In the Circuit Court of the United States, Eastern Division of the Northern District of Ohio. In Equity.

THE EXPANDED METAL CO.
v.
THE GENERAL FIREPROOFING COMPANY.

Proofs in rebuttal on behalf of complainant, taken before R. M. Kelly, Notary Public, as Special Examiner, by consent, at 926 Walnut Street, Philadelphia, Pa., commencing on Monday, June 11th, 1906, at 2 o'clock P. M.

Present: ERNEST HOWARD HUNTER, ESQ., for complainant. THOMAS W. BAKEWELL, ESQ., for defendant.

RUDOLPH M. HUNTER, having been duly sworn, testifies as follows:

By Mr. HUNTER:

Q. 1. What is your name, age, residence and occupation?

94 A. Rudolph M. Hunter, in my fiftieth year; Philadelphia, Pa., Solicitor of Patents and Mechanical Engineer.

Q. 2. What training and experience have you had in the mechanical arts and sciences and particularly with reference to construction and use of expanded metal, that may qualify you to testify as an expert in this case.

A. I am professionally educated in the arts and sciences, and as a mechanical engineer, have designed and constructed and superintended the construction of a great deal of machinery and engineering work. I am familiar with the construction and use of expanded metal, such as involved in this suit. I have closely watched the manufacture of such expanded metal, and in this connection have had occasion to direct the operation of machines employed in making the same, and am thoroughly familiar with the expanded metal art. I have been engaged in the patent business since 1871, and have prepared and prosecuted very large numbers of applications for letters patent. For about twenty-eight years I have been frequently called upon each year to give expert testimony in suits involving the infringement of letters patent, and some of these have related to expanded metal and concrete structures, reinforced by expanded metal. I have also been frequently called upon to make comparisons between structures, one or more of which contain patented improvements, with a view of reporting upon similarities and dissimilarities, with respect thereto. I have also had occasion to make a very large number of inventions of my own, and upon a portion of these I have taken out several hundred letters patent.

Q. 3. Have you examined a copy of letters patent of the United States No. 527,242, dated October 9th, 1894, the same being the patent in suit, and if so, do you understand the improvement in the method of making expanded metal described and claimed therein?

A. I have Examined the letters patent referred to in the
95 question and fully understand the invention therein described and claimed.

Q. 4. Have you read the depositions of John F. Golding and Wm. H. Moddy, taken on behalf of complainant, and of Oscar F. Gunz, Julian Kennedy, William F. Kearns, and Herbert E. White, taken on behalf of the defendant, and have you examined the various exhibits referred to in said depositions?

A. I have read all of the testimony of the several witnesses, to which you have referred, and believe I understand the same, and I have also examined the various exhibits offered in evidence in this case, and understand the same.

Q. 5. The patent in suit relates to a "method of making expanded sheet metal"; will you please define "expanded sheet metal."

A. It may be defined as unitary reticulated or open mesh sheet formed by expanding a sheet of metal into a greater area than that which the said sheet originally had.

Q. 6. Will you please refer to the prior art as it may be known to you, and explain the origin and development of expanded metal and the improvement in the method of making such metal, which is described and claimed in the patent 527,242, in suit?

A. The first illustrated form of expanded metal may be said to be found in the patent to Golding No. 297,382, of 1884, but prior

to the date of that patent, there was a description in the form of a provisional specification filed in the British Patent Office to one Thomas Long, No. 2125 of 1862, which briefly described a method of making expanded metal which corresponded very closely to that which is described and illustrated in the Golding patent of 1884. It appears that from 1862, up to the time of Mr. Golding's invention in 1884, expanded metal was not practically employed or manufactured. It will suffice therefore to consider Mr. Golding's
96 patent of 1884 as the illustration of the first form of expanded metal, and the method employed in producing it, which was made available. It was from this primary method of manufacture that the later development followed, which later developments were due to the efforts of Mr. Golding, and finally resulted in the method of manufacturing expanded metal described and claimed in the complainant's patent in suit.

In this early patent No. 297,382 of Mr. Golding's, the method employed in producing expanded metal was to slash a sheet with a series of slashes in the direction of the length of the sheet separated by short uncut portions, and these supplemented by a second series of slashes of similar character, but so spaced that the uncut portion in the line of one series of slashes come opposite the middle of the slashes of the preceding series of slashes, and so on, until the entire sheet is slashed. The sheet in this form is then stretched in the direction transversely to the line of the slashes and in the plane of the sheet, with the result that the surfaces of the metal between the slashes change their position so as to assume a position substantially at right angles to what was formerly occupied by the sheet, as is clearly shown in the perspective view, Fig. 2, of the patent.

Following the method shown and described in the 1884 patent Mr. Golding made a further improvement in expanded metal and method of producing the same, disclosed in patent No. 320,240, of June 16th, 1885. In this case the slashes corresponded in position to those of the former patent, but are in the form of elongated perforations, such as if a narrow strip were punched out for each slash. The sheet so produced was stretched, that is to say, made to assume a greater area than that originally occupied, very much in the manner formerly employed in the expanded metal of the 1884 patent; but in this case the series of bars connecting the uncut portions are not in direct frictional contact, and the sheet may be ex-
97 panded by applying pressure transversely to the plane of the sheet, enabling the several strands to take on the shape illustrated in Fig. 2, of this patent. The general method of producing the expanded metal in the 1885 patent might be said to belong to the same class as that of the 1884 patent, since in both cases the entire sheet is prepared by a preliminary cutting before the expanding operation begins. Shortly following the Golding 1885 patent is found the Johnson British patent No. 11,332 of 1885, which corresponds very closely to what is disclosed in the Golding 1885 patent, but as the Golding patent is based upon an application filed in 1883, it is quite evident that the British patent to Johnson is about two years later from the application of Golding.

The next improvement in the art of making expanded metal work is disclosed in letters patent No. 320,242, of June 16th, 1885, to Golding & Durkee. The method disclosed in this patent differed from those of the prior patents in that no slash or cut was made in the sheet except at the time and during the formation of one or more of the meshes and the bars or strands bounding them. This was the first method or process for producing expanded metal by simultaneously cutting and bending the sheet metal operated upon, and was undoubtedly a great advance over the former methods of making expanded metal as disclosed in the prior patents to which I have referred. The method employed in this patent No. 320,242, was predicated upon the former practice of simply severing the sheet at the proper place and then bending it into the proper mesh, and the method or process employed to produce the expanded metal is ingenious and one which must have taken a great deal of thought and reasoning before any type or form of machine for carrying out the process or method was devised. The principle employed in the method of making expanded work by this patent comprehended the simultaneous slashing and bending of the metal so liberated
98 from the body of the sheet, and to perform this operation it
was necessary that at one end of the sheet in the beginning of the operation there shall be one free bar or strand, as shown at *a* in the drawing of the patent. The cut or slash forming the said bar is made in the lower right hand corner of the sheet. This slashing of one end of the sheet is necessary throughout the entire operation, so as to enable the strands adjacent to the slashing to be bent downward, and thereby permit every other parallel strand of the same row to be similarly bent down simultaneously therewith. The operation is such that the sheet is slashed by a series of slashes out of alignment and in step form looking down upon the surface of the sheet, and the bars formed by this slashing are further divided during the formation of the meshes which are produced by the bending down of the bars so that portions of the metal of such bars assume oblique positions to the metal plate and the remaining portions of the bars are depressed by the action of the dies maintaining a position parallel to the surface of the plate. The meshes formed by this operation are bounded by flat bars or strands which form a sheet of expanded metal transversely to the plane of the surface of the plank. To more fully explain the operation of producing the expanded metal under the method of patent 320,242, I had prepared under my direction three samples, the first of which shows the operation of the cutters when producing the series of slashes preliminary to forming a series of meshes, and these slashes are shown on a blank from which a series of meshes have already been formed, the said meshes being connected to form expanded metal. The next sample to which I will refer is one in which the incisions or slits are carried to a somewhat greater extent, and the subdivision of the bars so formed begun. The subdivision which I have reference to is the splitting of the thick portions of the bars on the line
99 of the incisions toward the juncture of said thick bars and
the oblique bar connecting therewith.

The third sample which I produce, shows a continuation of the method which was in progress in second sample, and in this we have the wide portion of the bars considerable split and which splitting operation would be continued until the said wide portion of bars were subdivided almost up to the juncture of the oblique bars immediately to the right of the said widened bar.

The operation which takes place in the making of expanded metal exhibited in these samples depends wholly upon the cutting and bending. No stretching is at all required beyond such as would necessarily take place in slitting and the ordinary manipulation of appliances for bending. No stretching is desired and none is necessary as a part of the method employed, as the said method simply comprehends the slitting or shearing, or more correctly speaking, the slitting and shearing, of the sheet simultaneously with the bending of those portions of the sheets which are to constitute the bars or strands surrounding the meshes, the said bending being an act which takes place simultaneously with the slitting and shearing. The slitting may be considered as the first incisions shown in the first sample, and the shearing may be considered the slitting of the wide portions of the strands. In the formation of the mesh the shearing of the wide portion of the strands is essential and this takes place simultaneously with the bending of one half of the said divided strand, which portion assumes an oblique position. I would also explain that the incisions which are made in the blank, more fully shown in the two first samples I refer to, are simultaneously increased in a leftwardly direction while the wide portions of the strands are being slit or sheared in a rightwardly direction, and it is in this manner that the next oblique strand or bar is formed of the full height or
length. In other words, this bar does not exist in the first
100 sample, it is shown to an exceedingly small extent as begin-
ning in the second sample, and has taken on a length approximately one-half its full length in the third sample. The full length of these bars will be secured when the shearing operation of the wide parts of the horizontal bar and the blank has been completed in the formation of any series of meshes. In the formation of expanded metal in this manner, the bars or strands bounding the series of meshes made previously to those in process of making must be completely disconnected from the blank except through the oblique bars which are being formed in the making of the new series of meshes, as particularly illustrated in the third sample which is marked "Sample C". Owing to the fact that this expanded metal is produced by a process in which the essential characteristics are slitting or shearing and bending, it necessarily follows that the finished sheet is very much shorter than the blank from which it is formed, or as the patent states,

"In the act of cutting and forming the meshes, the finished article is contracted in a line with the cuts or incisions, and consequently it is shorter in this direction than the piece from which it is cut. * * *"

As an example of this shortening of the finished sheet of expanded metal compared to the blank from which it is made, I produce a finished sheet and also a blank of the same size and shape as the original blank from which the sheet of expanded metal was formed.

One of the peculiarities of the method forming the basis of patent 320,242, is in the fact that the slashes or cuts made in the blank at any moment in the formation of the series of meshes are not in the same line, and this is one of the essential features of the method, because if they were made in the same line, it would be an utter im-
possibility to produce the expanded metal disclosed, because
101 the bending of the several bars of strands could not take place,
as before explained. It was because of this that the patentees
stated in their specification lines 51 to 58, as follows:

"It is evident that the meshes could not be cut and simultaneously formed if the cuts were made in a single direct line across the metal, for the reason that as the meshes are made the article which they form is contracted to a length less than the original length of the metal from which it is cut."

This quotation shows very clearly that the patentees relied upon the cutting and bending operations to form the meshes, and did not in any manner consider that stretching of the bars or strands was involved as an essential part of the process, and that if any stretching did take place it was a mere incident due to the shearing operation and not desired or intended. Such stretching may be considered as a negligible quantity because it is insignificant as compared with the great contraction in the finished sheet with respect to the length of the blank from which it is formed.

Patent No. 320,242, for the method of making the expanded metal, to which I have just been referring, contains a reference to an application filed August 28th, 1884, which sets out or describes a machine for commercially manufacturing the expanded metal disclosed in the said patent 320,242. This machine is fully disclosed in patent No. 320,241, of June 16th, 1885, to the same patentees, Golding & Durkee, and was subsequently improved as shown in later patents, namely, No. 381,230, of April 17th, 1888, to Golding & Durkee and No. 381,231, of April 17th, 1888 to Golding. These machines embody a series of lower knives carried upon a longitudinally reciprocating bar, the said knives being stepped so that they are slightly oblique to the plane of the travel of the bar which carries them. Arranged above these series of knives is a second series carried by a verti-
cally reciprocating frame and the said knives are also stepped
102 so as to correspond and co-operate with the lower of said
knives. As the upper set of knives descend, they operate in
conjunction with the lower knives to produce the slits or incisions and then as they continue their downward motion the bar carrying the lower knives is moved longitudinally so as to permit the upper knives to descend while co-operating with them to produce the shearing of the blank and the wide portions of the bar in the samples which I have produced, to form the oblique bars or strands. During this cutting and bending operation by the cutters the blank remains stationary, but the expanded metal which has been previously formed and which is depending from the edge of the blank being operated upon swings backwardly to follow the movement of the longitudinally moving bar carrying the lower cutters. The longitudinally

movable bar is given the proper reciprocation by means of a cam, so that its reciprocation is exactly timed with the vertical movement of the upper cutters or knives. These machines are also provided with feeding mechanism for the blank which causes the blank to be fed across the cutters on a slightly diagonal line, and the feeding is performed intermittently so that the blank is held stationary during the cutting and bending operations and is fed forward when the knives separate to take a position for the next cut.

Such is the prior art with reference to expanded metal at the date of the complainant's patent in suit. This prior art may be classified as disclosing two general methods of manufacturing or making expanded metal.

The "first" method embodies two distinct steps, namely, the slitting or slashing of the entire sheet and then the subsequent pulling of the sheet into an expanded form to produce the meshes.

The "second" general method comprises the simultaneous slitting or shearing and bending of the cut portion of the blank into
103 the form to constitute the meshes of the expanded metal, this latter being a more practical or commercial method than the first, and being that which was commercially practiced at the date of invention of the third method, or that embodied in the complainant's patent in suit.

In both the first and second methods there was very decided and extensive shortening of the sheet of expanded metal compared with the length of the sheet from which it was produced.

Complainant's Patent.

I now come to the method disclosed in the complainant's patent in suit, which was the next step in the development of the commercial manufacture of expanded metal, and this method may be designated as the "third" method for producing expanded metal.

The method forming the subject matter of the complainant's patent in suit, namely, patent 527,242, of 1894, differs radically from the first and second methods which I have before explained, because in this method the length of the expanded metal sheet is maintained at the same length as the blank from which it is made, and this result is secured by employing, as an essential part of the process, the positive stretching or elongation of the connecting bars which form the sides of the meshes.

In this process or method the bending and slitting take place simultaneously with the stretching, and are commensurate with it, and no bending can take place to any extent in the formation of the bars or strands making up the mesh structure without producing at every moment of the formation of such bars or strands a stretching of the metal to provide the length of the metal required.

Adjourned to Tuesday, June 12th, at 11 A. M.

104 PHILADELPHIA, TUESDAY, *June 12th*—11 a. m.

Met pursuant to adjournment.
Counsel present as before.

Complainant's counsel offers in evidence the three samples of metal made according to the process of patent 320,242, and the same are marked Complainant's Exhibits Nos. 13, 14 and 15, "Process of patent 320,242" Samples A, B and C respectively;

Also the full sized sheet made according to the process of patent 320,242, and the same is marked Complainant's Exhibit No. 16, "Full size Sheet Process of Patent 320,242";

Also the blank corresponding to that from which Exhibit No. 16 was made, and the same is marked Complainant's Exhibit No. 17, "Blank of full Size Sheet of Process of Patent 320,242";

(The witness RUDOLPH M. HUNTER, resumes his answer to Question 6.)

More specifically considering the method employed in making the expanded metal under the complainant's patent in suit, I find that it comprehends the clamping of the blank firmly at the time of forming the bars or strands so that the blank shall not be permitted to contract in the direction of its length, and as the several strands or bars forming the meshes are attached to the blank at the time of the formation of the said meshes, it follows that the expanded metal must also have the same length as the length of the blank from which it is made. As the bars or strands are of sinuous form across the sheet it follows that the total length of the metal measured along the said strands must be of greater length than the length of the 105 blank, and consequently this increase in length can only result by stretching the metal constituting the bars or strands.

As the slitting and bending operation in the formation of the bars or strands is necessary to the making of the expanded metal they must be considered in conjunction with the essential feature of stretching of the bars and which is the basis of the method claimed in the complainant's patent in suit. That is to say, there must be a simultaneous slitting, bending and stretching operation in the formation of the strands which make up the boundaries of the meshes, and under no condition can the method of this patent be practiced by merely slitting and bending, as in the case of the second method before referred to. The stretching in this third method is essential to the carrying out of the method claimed, and it is utterly impossible to have the bending operation in this method without a very material stretching.

In the making of the expanded metal by the method of the patent in suit, the blank is placed between two cutters, the lower of which is a straight or plain blade, whereas the upper cutter consists of a series of V-shaped blades which in co-operating with the lower cutter, will sever the blank in the direction of its length at a series of points and simultaneously therewith depress the severed portions into the form of a series of V-shaped loops. When this is accomplished the upper

cutters rise and then are shifted longitudinally so as to assume a position which will enable them to perform the next cutting operation in alignment with those portions of the blank adjacent to the union of the blank with the bars or strands of the previously severed portions. Before the cutters descend the blank is fed forward a short distance to give metal sufficient for the next series of bars or strands and when the cutters descend, a second series of loops are formed which provide bars or strands that complete the meshes started by the first series of loops and form the second series
106 of half loops for the next series of meshes.

This operation is again repeated after the upper cutters have been shifted back to their original position. The result of this is the production of expanded metal having substantially diamond shaped apertures or meshes and in which the expanded metal is formed as a sheet at approximately right angles to the plane of the blank. In actual manufacture it is sometimes customary to shift the blank in the direction of its length in place of shifting the cutters, either of which methods may be employed.

After referring to the prior art *of* the patentee states:

"In my present invention I seek to avail myself of the ability of the metal to stretch or distend as well as of its ability to bend under strain or pressure, and the invention consists in the improved method of making expanded metal, viz.: by simultaneously cutting and opening or expanding the metal at the cuts by stretching the several portions."

And further on, he again states:

"It will be noticed that at the time the bend is imparted to the severed portions, there can be no contraction in the product from the length of the sheet A, because the ends of the severed portion or strand are still integral with the sheet and will not permit it."

In the making of expanded metal under the process of the patent in suit, a mesh cannot be made at one operation, because it is essential to first bend and stretch two of the bars which constitute one-half of the mesh and then subsequently bend and stretch the remaining two bars which constitute the other half of the mesh. For this reason it is only possible to produce a half mesh at any one place with one reciprocation of the cutters, differing therein from the method forming the subject matter of patent No. 320,242, namely, the second method, in which a full mesh was formed with each reciprocation of the cutters.

107 The claim of the patent in suit reads:

"The herein described method of making open or reticulated metal work which consists in simultaneously slitting and bending portions of the plate or sheet of metal in such manner as to stretch or elongate the bars connecting the slit portions and body of the plate, and then similarly slitting and bending in places alternate to the first mentioned portions, thus producing the finished expanded sheet metal of the same length as that of the original sheet or plate, substantially as described."

I understand the language of this claim to be descriptive of the method of making an expanded metal sheet, and that the said expanded metal sheet shall be formed in the manner substantially as described in the specification.

As expanded metal necessitates the idea of connecting bars or strands of a sheet being extended in a direction transversely to the length of the original blank, it follows that the statement "and then similarly slitting and bending in places alternate to the first mentioned portions" means just what is described in the specification and illustrated in the drawings, namely, the slitting and bending coupled with the stretching immediately adjacent to but alternate of the previously slit bent and stretched portions, so that the previous portions may be pressed away transversely from the plane of the blank to create the expanded feature of the expanded metal.

In other words the method described in the claim necessitates that the body of the metal forming the blank shall be so slit and expanded that it is completely transformed into expanded metal, so that its presence as a blank becomes eliminated and in its place we have an expanded metal sheet lying in a plane transversely to that which was formerly occupied by the blank itself.

The claim further specifically requires that the simultaneous slitting and bending shall be performed in such a manner as to
108 stretch or elongate the bars connecting the slit portions and
the body of the sheet, and from this I understand that the stretching or elongation of the bars is an essential feature of the method, and that without it, it would be impossible to form the bars or connecting portions.

Moreover, the claim recites that the finished expanded sheet of metal produced is to be "of the same length as that of the original sheet or plate," and this could not be possible without the stretching or elongation of the bars forming the strands of the meshes.

The references to the "bars" connecting the slit portions and body of the sheet, I understand to refer to those portions which are directly connected with the edge of the sheet and which unite in a detached portion of the sheet previously forced away from the sheet by the upper cutters and which portion is produced by the first act of the descending cutters upon the sheet or blank, and which portions do not in reality form the bars themselves. The stretching of the bars takes place as soon as the upper cutters penetrate the metal of the blank, and this stretching takes place simultaneously with the slitting and downward bending of the metal, so that it is accomplished by increments and is completed when the upper cutters are fully depressed, or at the completion of their stroke.

Q. 7. Have you personally studied the making of expanded metal, both according to the process of the Golding & Durkee patent 320,242, and according to the process of the patent in suit, as such processes are carried out in the commercial production of expanded metal?

A. I have. I have very carefully watched the operation of the machines employed in the commercial manufacture of expanded metal under both processes, namely, those which I have termed the "second" and "third" processes, and embodies in the patents to which you have referred.

Q. 8. Please compare the said two processes and point out 109 what you understand to be the essential differences between them?

A. For convenience in answering this question I will refer to the method of patent 320,242, as the "second" method, and the method of patent 527,242, in suit as the "third" method.

As I have before testified, the second method of making expanded metal depended solely upon the idea of slitting and shearing coupled with bending, and necessarily involves the feature of shortening the expanded metal sheet so that it is greatly shorter than the length of the blank from which it is made.

On the other hand the third method of producing expanded metal involves the idea of slitting bending and *stretching* the bars and without any appreciable shortening in the sheet of expanded metal compared with the length of the blank from which the expanded metal is formed. Under this method the length of the expanded sheet is predetermined and is accurately maintained.

In the second method, the diagonal manner of slitting the sheet produces at the end of the expanded metal a series of irregular meshes, so that it is necessary to trim or finish the ends of the sheet to bring it to merchantable form.

On the other hand, the third method produces an expanded metal sheet which has ends of uniform character throughout and in such forms that they require no trimming or other attention, and consequently the loss of time and the cost for labor incident to the completion of the ends of the expanded metal of the second method are entirely eliminated from consideration when the expanded metal is made under the third method.

In the second method the bars are bent into the desired form to make the meshes, whereas in the third method they are stretched into the form. There is a bending in both cases, but in one it is produced merely by changing the position of one end of the 110 strand without affecting the physical character of the metal, and in the other or third method, it is produced by pulling out the fibres of the metal without changing the position of either end of the strand.

In the second method such stretching as might occur is a mere incident to the operation of the machine, whereas in the third method the stretching of the bars is an essential and necessary part of the method to secure the result desired. In fact it is an utter impossibility in the third method to eliminate the importance and necessity of the stretching operation.

In the second method any individual mesh is made and completed with one stroke of the cutters, whereas in the third method two strokes of the cutters are required to complete any individual mesh, and it is utterly impossible under the third method to produce a complete individual mesh by a single reciprocation of the cutters.

In the second method the bars forming the boundary of the meshes are of the same cross section in the finished product, as was the metal of which they were formed at the moment it was separated from the blank, whereas in the third method the cross section of the bars in the finished expanded metal are of less sectional area than the metal of the blank from which they were formed, and moreover they have a greater tensile strength in the finished form than the same metal embodied when forming a part of the blank or at the moment of severance from the blank. In the second method the strength of the bars remain the same under all conditions, just as the cross section remains the same.

Q. 9. Will you produce a full sized sheet or sheets of expanded metal made according to the third process, *i. e.* the process of the patent in suit, and also a blank corresponding in size and form to that from which such sheet or sheets were formed.

A. I produce two sheets of finished expanded metal which
111 sheets are of the same size, and I also produce a blank similar to the blank from which these two sheets were made. I might say that in making two or more sheets of expanded metal, where possible, they are made from a single blank. After a given number of strokes of the machine, and without removing the blank from the machine one sheet is severed, so that the subsequent operation of the machine produces a second sheet from the remaining portions of the blank.

In this case there would be only one final strip of selvedge to the two sheets. The same would be true if a series of sheets were made from the same blank, as frequently is the case where an order comes for definite size sheets. This reduces the so-called waste to a minimum, and leaves it in a form in which it is in excellent condition for numerous uses in the industrial art where strips of sheet steel are required. On one of these sheets I produced this selverge or strip of the blank is purposely left on the sheet, so that its size will be seen. These sheets are six feet by ninety six inches, and have what is known as a three-inch mesh. The blank from which they were made was 16 inches by 96 inches.

Complainant's counsel offers in evidence the sample sheets and blank produced by the witness and the same marked Complainant's Exhibit No. 18, "Full Size Sheets Central Co., Process of Patent in Suit," and Complainant's Exhibit No. 19, "Blank of Full Size Sheets, Central Co., Process of Patent in Suit."

Recess until two o'clock.

Q. 10. You have referred to the selvedge or uncut strip on the edge of one of the sheets forming Exhibit No. 18; what relation does this selvedge bear to the area of cut or expanded metal, and upon
112 what does the relation between the uncut selvedge and the expanded area depend?

A. The relation between the area of the selvedge and the area of the expanded metal depends upon the size of the blank from which the expanded metal is made, and upon the size of the meshes in the expanded metal which largely governs the area of the expanded metal as a finished sheet. The amount of selvedge as a possible waste so-called, with respect to the area of the expanded metal, may be made insignificant by simply employing a blank of considerable width from which a number of sheets of expanded metal may be cut in succession, with the result of only a single narrow strip of selvedge in the last sheet, which, if apportioned off as waste chargeable against all of the sheets would reduce this waste to a very small percentage for each sheet. In some cases the expanded metal sheets are relatively very small to what is possible to be made by the machine from the blank, and therefore there may be as many as a dozen of sheets made from a blank of ordinary size, and with only a single small selvedge or so-called waste strip for all of these sheets.

In the third method, namely, that of the complainant's patent in suit, there is practically no limit as to the area of the blank which may be used if so desired.

Q. 11. What advantages, if any, has expanded metal produced by the process of the patent in suit over expanded metal produced by the second or earlier process of the patent 320,242?

A. The expanded metal of the third process, namely, that of the complainant's patent, has many advantages over the expanded metal of the second method, namely, that which depends upon the slitting and shearing with bending as the sole requirements in forming a complete mesh, and I would mention the following as among some of the advantages:

113 The expanded sheet is far more perfect in form, that is, it is exceedingly regular in its meshes and absolutely rectangular in the area of the sheet.

It is far more uniform in its structure, that is to say, the bars are symmetrical throughout the entire sheet, and there is no raggedness and irregularity in the form of the bars, as is so noticeable in the expanded metal of the second method.

The meshes are complete on all four sides of the sheet, there being no projecting loose strands or bars, as is the case in the expanded metal of the former method. As the expanded metal sheet leaves the machine in perfect form, there is no labor required in straightening or finishing the ends of the sheet, as is always required in the expanded metal of the second method.

The third method is such that with the same apparatus or machine, a variety of forms of expanded metal may be produced, that is to say, sheets having meshes of different shapes and sizes, which is impossible in the machine for producing expanded metal under the second method. In this statement I have reference to the production of expanded metal with the meshes fully formed.

The expanded metal of the third process is also exceedingly uniform in weight, which is a feature not found in the expanded metal of the second process. The method employed in the third process enables a single machine to have capacity for producing metal of almost any length, that is, expanded metal may be made from a blank of any length desired, which is impossible in a machine operating under the second method.

The third method also is of such character that a machine may be built for producing expanded metal of large sizes, that is to say from sheets of considerable thickness without excessive cost of constructing the machinery. In fact it has been considered impracticable 114 to build machines for producing expanded metal under the second process from sheets of greater thickness than No. 16 gauge. Even though it were possible to build more powerful and heavier machine for carrying out the second method, they would be very expensive to construct and costly in the direction of repairs.

In my opinion the method of the third process is more rapid in the production of expanded metal than the second method and requires less care on the part of the operator. The sheets of expanded metal under the third process leave the machine in a flat condition, or where there is a slight curve in such a uniform smooth condition that they may be considered as flat sheets as compared to the irregular and uneven form of the sheets produced under the second method.

The third process is such that the manufacturer may readily change the product as to gauge and sizes of mesh, without material increase in expense as to the equipment of the factory, as it is only necessary to change the upper knives and readjust the machine to suit the particular form of expanded metal to be produced.

I might also say that in the expanded metal of the third process the lines drawn through the intersections of the meshes in one direction are at right angles to the line drawn through the intersection of the meshes in the other direction, and these lines are parallel respectively with the sides and ends of the sheet, whereas in the expanded metal produced under the second method, such lines are not at right angles to each other, and they are not respectively parallel to the sides and ends of the sheet, one of them only being parallel and the other being oblique.

Q. 12. The defendant's witnesses have stated that under the process of patent 320,242, which you call the second process, as it is carried out commercially, the strands are more or less stretched, 115 while they are being cut and bent. From your personal observation of that process, as it is carried out in practice, what stretching, if any, takes place in the strands, to what is it due, and is it in your opinion, the same as the stretching or elongation of the strands referred to in the patent in suit?

A. The stretching in the second method does not correspond in any sense to the stretching or elongation called for under the third method, namely, that of the patent in suit. Such stretching as occurs is a mere incident to the slitting and shearing operation preliminary to the bending of the slit portions into the mesh form.

Such stretching as takes place occurs in the manner indicated by the two samples which I have heretofore produced, namely, samples A and B from which it will be seen that the stretching is incidental to the formation of the slits from which the bars are made. This stretching happens to be more perceptible in these samples than is necessary, because the cutters or knives happen to be so shaped or formed that the metal is somewhat bent in the preliminary slitting and shearing operation; but said stretching, such as it is, is of no consequence whatever, and if entirely eliminated would not interfere in the smallest degree with the method of forming the completed mesh which constitutes the basis of the second method of forming expanded metal, said method depending wholly upon cutting and bending, and in no sense upon stretching.

Moreover the amount of actual stretching, because of the peculiarity of the machine itself in its treatment upon the metal, is exceedingly small, and when taken into consideration with the enormous shrinkage in the length of the expanded metal sheet as compared with the length of the blank from which it is produced, said stretching may be considered as a negligible quantity. Its presence or absence would not in the smallest degree change the method or result.

116 Q. 13. What is the effect of the stretching or elongation of the strands that takes place under the process of the patent in suit upon the character of the metal composing the finished strands?

A. It is to increase the tensile strength, and this increase in the tensile strength is very material.

Q. 14. Mr. Kearns has testified that this stretching of the metal under the process of the patent in suit, renders the strands of the finished sheet so hard and brittle that annealing is required to remove the hardness and render the expanded piece available for use in re-enforced concrete construction. Do you consider such annealing necessary?

A. I do not, because it is possible to form the shape of the diamond meshes such that excessive stretching will not take place, and therefore, the brittleness which might necessitate annealing would not be created to an objectionable extent. It is only when the diamond meshes are stretched to form the greatest possible opening or gap, that the excessive brittleness appears, and which is to be cured by annealing. In the case of expanded metal made under the third process, in which the diamond meshes are flatter, that is with a greater difference between the two diameters, the brittleness is not objectionable and annealing is not required.

As a sample of what I mean, I produce a sheet made under the third method having a four-inch mesh, and this sheet is not annealed, and does not require annealing for uses as you have mentioned in your question.

Complainant's counsel offers in evidence the sheet of expanded metal produced by the witness and the same is marked Complainant's Exhibit No. 20 "Full Size Sheet, North Western Co. Process of Patent in Suit."

Q. 15. Mr. Gunz on behalf of defendant has referred to a series of patents relating to metal lathing, and has stated that the Ohl patent No. 475,700 may be taken as fairly representative of 117 that class. What, in your opinion, is the fundamental difference betewen metal lathing such as is disclosed in this Ohl patent 475,700 and the other patents of that class and expanded metal, whether made under the first, second or third process of making expanded metal to which you have referred in your testimony?

A. Metallic lathing of the character referred to in your question differs from expanded metal in that it simply consists of a sheet having portions thereof stamped up or raised, so as to form interstices and projections to which the mortar may be attached, the sheet in all cases remaining of substantially the same area after the manufacture into metallic lathing that it occupies as a blank from which the metallic lathing is made. In other words, this metallic lathing is not expanded metal in any sense, as its area is the same as the blank from which it was made. The portions of the lathing which are forced upward into loops have no definite relation or connection to other loop portions, and more or less of the loop portions may be omitted if desired, without otherwise changing the integrity and general character of the sheet of metallic lathing.

On the other hand expanded metal consists of a series of properly connected loops, one being dependent upon the other for its integrity and support in the entire sheet, and the expanded metal as a finished product being greatly increased in area over the blank from which it was made. In metallic lathing, one complete row of loops might be eliminated or removed without otherwise changing the structure or the integrity of the sheet, whereas if we remove one complete row of the looped portions in the expanded metal the integrity of the sheet is destroyed at once. There is no similarity between the two.

Q. 16. Referring particularly to the Ohl patent 475,700, please compare the production of the metallic lathing described 118 therein, with the method of making expanded metal according to complainant's patent 527,242?

A. Referring to the Ohl patent I find that it comprises two rolls, one of which is furnished with a series of depressions separated by cutting disks, and the other of which is provided with a series of circular corrugated knives. These knives *b* operate in conjunction with the circular discs or knives *h*, so as to cut two incisions, namely, one upon each side of the knife. As these knives are made in corrugated form, these incisions will be repeated across the sheet at given intervals, as the sheet is fed between the rollers. At the same time that the cutters make the two incisions, they bend down the strip of the plate between the incisions into the form of a loop. As there are a series of these cutters, it follows that the plate will have a series of rows of loops cut and pressed upward from its surface, as shown in Figs. 10, 11 and 12.

Moreover the cutters *d* are staggered, that is to say, the adjacent cutters are placed out of lignment, so that the adjacent rows of loops are spaced as indicated in Fig. 10. It will be observed that these loops are formed upon the surface of the sheet S as individual loops and are each surrounded by an integral portion of the sheet itself, so that any one or more of the loops may be eliminated without disturbing the form of connection of the remaining loops. In this machine it is essential that there shall be two parallel incisions made for the formation of each loop, and no act of cutting and forming one loop can in the least affect or modify the form of another loop, so that the various loops have no co-operation or relation to each other, which in any wise affect their production or the space or gap produced by them.

There is nothing in this Ohl patent which in the smallest manner indicates the making of expanded metal, nor which could in any way imply a method such as claimed in the complainant's patent in suit. It is true that the individual loops in the Ohl patent are stretched, but that is no more than the streching of any metallic structure which is struck up from sheet metal. There is no method embodied in the Ohl patent, because the formation of each individual loop is a complete act in itself and is wholly independent of the formation of all the remaining loops of any of them.

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In the case of the complainant's patent, the method requires the formation of the successive series of loops in such a manner that they shall co-operate and constitute a part of the meshes of the preceding loops so as to produce what is known as expanded metal. All of the loops depend for their usefulness upon the remaining loops, and the expanded metal consists of a large number of connecting loops without any sheet to which they are attached. The method involved in the complainant's patent, contemplates the pressing away of the successive series of loops from the blank with the formation of each successive series of loops, so that the act of forming every new series of loops removes the previous series from its connection with the blank, but maintains them in proper co-relation with the previously formed loop.

In my opinion there is not the smallest indication of the process of the complainant's patent in suit disclosed in the Ohl patent referred to.

Q. 17. Mr. Gunz has produced a sample which is marked Defendant's Exhibit "Gunz Sample Broken." Is it in your opinion possible to produce metal such as is formed by the small strands on one edge of this sample, or any form of expanded metal, by following any mode of operation described in the Ohl patent, or by means of the mechanism shown and described therein.

120 A. It is not. The sample Defendant's Exhibit "Gunz Sample Broken" was undoubtedly a specially prepared sample made by hand manipulation, and such sample could not be produced on the machine as shown in the Ohl patent. It is utterly impossible to produce expanded metal from anything which is disclosed in the Ohl patent.

I might give as my reasons for this statement, the fact that if the housings of the machine were made so as to permit the blank to be adjusted endwise between the rolls, any attempt to so manipulate the blank as to produce the series of loops in juxtaposition such as is necessary for expanded metal, would cause the sheet metal to either be divided into strips or so mutilated as to render it unfit for any purpose whatever, not even for metallic lathing.

Q. 18. Will you produce a sample of commercial metallic lathing, such as is shown in the Ohl patent, or any of the other patents relating to metallic lathing to which Mr. Gunz has referred.

A. I produce a sample which is perhaps more nearly that of the Bostwick patent 459,625 of 1891, but corresponds to what is shown in the Ohl patent, with the exception perhaps of the longitudinal corrugation in the body of the sheet.

The sample produced by the witness is offered in evidence and the same is marked Complainant's Exhibit No. 21, "Sample Ohl-Bostwick Lathing."

Q. 19. Will you refer to the application file of the complainant's patent in suit, and state, so far as it may appear from the application file, how the particular phraseology of the claim of the patent in suit, came to be adopted?

A. The application was originally filed with one claim; then by amendment a second claim was added, thereupon the Examiner rejected claim 1 on the patent of Ohl No. 475,700 of 1892; the application was then amended by cancelling claim 1. The Patent Office then gave an action in which the form of claim 2 was criticised, in which the Examiner pointed out that in his opinion the claim 121 does not clearly set forth the applicant's invention, nor distinguish it from the former patent granted to the applicant on June 16, 1885, No. 320,240, and at the same time the Examiner suggested a claim which was written out and enclosed with the Office action. With respect to this he stated, "It is suggested that applicant adopt the claim enclosed herewith and substitute it for the present claim." The claim suggested is the present claim in the patent in suit.

The applicant thereupon by an amendment cancelled the former claim 2 and substituted for it the claim suggested by the Examiner and which is now the claim found in patent 527,242 in suit.

Complainant's counsel offers in evidence a certified copy of the application file of the patent in suit No. 527,242, and the same is marked Complainant's Exhibit No. 22, "Application file of Complainant's Patent in Suit."

Adjourned to Thursday, June 14th, at 11 A. M.

PHILADELPHIA, FRIDAY, *June* 15, 1906.

Met pursuant to adjournment at 10 A. M.
Present: Counsel as before.

Direct examination of the witness, Mr. R. M. HUNTER, resumed:

By Mr. HUNTER:

Q. 20. Will you please measure Exhibits 16 and 18, and state the superficial area of the expanded metal in each, and also the relative areas of the sheets of expanded metal similar to those Exhibits which would be produced from blanks of the same width?

122 A. The area of the sheets Exhibit No. 18, cut from blank Exhibit No. 19, having dimensions of 16 by 96 inches, is 14,112 sq. inches, and the area of the expanded metal sheet No. 16, cut from a blank of 7½ by 96¾ inches is 3,553 square inches. As the blank from which sheet No. 16 was cut is approximately one half of the area of the blank from which sheet No. 18 was cut, it is

evident that with a blank corresponding to the area of the blank from which sheet No. 18 was cut, the area of the sheet like No. 16 would contain 7,106 square inches, or approximately one-half the total area of the sheets No. 18.

Q. 21. Referring to the Ohl patent 475,700, defendant's witness, Mr. Herbert White, has testified that from the drawing accompanying that patent there appears to be a stretch or elongation in the loop of 14 per cent. when the measurements are made from the end of one cut to the corresponding end of the next cut, and of about 23% when measured in the length of the cut itself.

Will you please measure correspondingly Exhibit No. 21, "Sample Ohl-Bostwick Lathing," and state what the percentage of stretching is in the loops of that Exhibit?

A. I have made the measurements called for and find that if we consider one of the loops, the central one for example, which appears to be the most stretched of all the loops, I find that the length of the chord of said loop measured on the surface of the plate is twenty-sixteenths of an inch, and length of the loop itself is twenty-one sixteenths, showing that there is a stretching equal to five per cent. Taking the measurement from the end of one cut to the corresponding end of the next adjacent cut in the same line, I find that the measurement along the surface of the plate is thirty-three-sixteenths inches, and that the measurement along the surface of the
plate between the loops plus the measurement of the loop
123 itself is thirty-four-sixteenths inches, and this gives a stretching of approximately three per cent.

Defendant's counsel objects to the answer because the sample from which the witness' measurements were made obviously does not conform to the drawings of the Ohl patent.

Q. 22. From your understanding of the making of Patent Office drawings, state whether such drawings, are supposed to accurately represent dimensions, sizes and proportions?

A. I have made thousands of Patent Office drawings in my time, and while I have also been accustomed to making accurate working drawings for machinery, I know it to be an actual fact not only from my own experience, but from the work of numerous draughtsmen who have been employed by me in making Patent Office drawings, that it is customary not to attempt to make Patent Office drawings accurately as to dimensions or proportions, it being the practice to exaggerate the proportions of those parts which are designed to disclose more particularly the portion involving the particular invention to be claimed. It is very seldom that a Patent Office drawing is accurate in dimensions.

Q. 23. It has been suggested by some of the defendant's witnesses that the claim of the patent in suit is not a claim to a process, but merely to the function of a machine. What is your opinion upon this point?

A. It is my opinion that the method described in the complainant's patent in suit and recited in the claim thereof, is a true method, and does not depend upon any particular machine or apparatus for

carrying it into effect. The method consists of the performance of a series of distinct acts or operations upon the metal, which by their succession, transform the metal into an entirely different and distinct form, having not only a difference in shape, but also a difference in molecular form and physical character, differing from
124 anything known or produced prior to the date of the patent.

Not only is the method different from all prior methods, but likewise is the product produced by the method different from all prior products, and from all products which could have been produced from any previously known method or machine.

End of direct examination.

Cross-examination:

Counsel for defendant objects to the last answer on the ground that it is a mere legal argument as distinguished from a statement of facts.

Complainant's counsel suggests that as defendant's experts have seen fit to give their opinion upon this question, it is only proper that complainant's expert should do the same.

By Mr. Bakewell:

X Q. 24. When did you first see in operation a machine making expanded metal?

A. May 29, 1906?

X Q. 25. Where?

A. At Pittsburg; at the works of Chess Bros.

X Q. 26. Have you since seen any such machine in operation?

A. No.

X Q. 27. How long a time did you spend at that examination?

A. The entire day.

X Q. 28. That is your sole practical experience in the observation of the working of expanded metal machines?

A. It is, and with my knowledge of such matters, it was amply sufficient.

125 X Q. 29. Are you the same Mr. R. M. Hunter who testified as a witness for complainant in the suit of The Expanded Metal Co., and others, against E. S. Bradford, and others, in the U. S. Circuit Court, for the Eastern District of Pennsylvania, No. 14, April Session, 1903?

A. I am.

X Q. 30. That suit was for infringement of the same patent that is in suit in the present case, was it not?

A. It was.

X Q. 31. Did you not say in that case in cross-examination, as follows, in a deposition given by you on September 13, 1904:

"X Q. 7. You have made reference in your direct deposition to the mechanical steps recited in the claim of the patent in suit, please tell me if you have ever seen such steps actually performed, and if so, when and where?

"A. I have never seen the manufacture of the expanded sheet metal described in the patent in the process of being produced, but the said process is so very simple that a clear understanding of it is easily had from the specification and illustration of the patent in suit.

"X Q. 8. Please tell me if you have ever seen a machine of the defendants' Bradford patent 664,379, granted Dec. 25th, 1900, in actual use? If so, tell me when and where?

"A. No; I have not seen the machine referred to in the question, and have not seen the making of expanded metal upon such a machine."

A. I did.

X Q. 32. What types of machine for making expanded metal did you see at the time of your visit to Pittsburg?

A. I saw several types of machines in operation, both for making the expanded metal under the second method and under the third method, for example, expanded metal such as shown in Exhibit No. 16 and Exhibit No. 18.

126 X Q. 33. What works did you visit at Pittsburg?

A. The works of the Central Expanded Metal Co., owned or operated by Chess Bros.

X Q. 34. How many machines adapted to make the expanded metal like Exhibit 16 of the same or smaller mesh, did they have?

A. I am not quite sure whether there were two machines for making that particular expanded metal, for I only gave attention to one which I had operated under my direction; the other machine was not running, and I did not examine it closely, or even sufficiently to now be sure just whether it was adapted to make expanded metal of the character of Exhibit No. 16.

X Q. 35. How many machines did you see there for making expanded metal like Exhibit 18?

A. My recollection is that there was six or seven of these machines.

X Q. 36. Did you examine these all in detail?

A. In a general way I did. I, however, examined some more than others.

X Q. 37. The sample Exhibit 18 you understand to have been made at these works in Pittsburg, do you?

A. I do.

X Q. 38. And the sample Exhibit 20 was made at the works of the Northwestern Metal Co., at Chicago. You so understand?

A. I do.

X Q. 39. And you also understand that all the concrete re-enforcements made at the Chicago Works has the same proportions of mesh as shown in Exhibit No. 20. Do you?

A. I cannot say of my own knowledge that the same proportion of mesh is employed in all the expanded metal for re-enforcement made by the Northwestern Expanded Metal Co., but I have been in-
formed that the proportion of the mesh shown in Exhibit
127 No. 20 is a fair representation of the character of mesh
which is ordinarily employed by the Northwestern Expanded Metal Co.

X Q. 40. Will you please measure and state on the record the dimensions of the mesh of Complainant's Exhibit No. 18, for instance, the Pittsburg sample.

A. The greatest diameter of the diamond mesh from centre to centre of the connecting portions is six inches. The shortest diameter is 2⅞ inches. The length of diagonals or connecting bars taken along the centre and to the extremities of the metal at the connecting portions of the meshes, is 3⅜ inches. I make a sketch showing exactly what I mean by these dimensions.

Recess until two o'clock.

Defendant's counsel offers in evidence the sketch produced by the witness and it is marked Defendant's Exhibit "Hunter Sketch."

X Q. 41. Will you now please state the percentage of stretch or elongation which has been imparted to the strands in the operation of making Exhibit No. 18, taking the dimensions as shown on your sketch?

A. About 13½ per cent.

X Q. 42. How do you figure that?

A. The total length of the diamond is 6 inches, and as there is a quarter of an inch at each end which is not cut, the total length of the opening is 5½ inches. The length of the two bars as shown in the sketch amounts to 6¾ inches, and after eliminating the quarter of an inch at the lower end of each bar we have 6¼ inches, which gives about 13½ per cent.

If we eliminate from consideration the half inch of metal joining
the two bars, the percentage of elongation or stretching of the
128 bars will be 15 per cent. If on the other hand we do not take
into consideration any of the unstretched portions and therefore do not eliminate any of the parts above eliminated, the percentage of stretching on the line of the bars would be 12½ per cent.

X Q. 43. If you take the sinuous line from one edge of the sheet to the other represented by a complete line of strands, and compare it with the straight line from which the strands are made, what is the increase of length due to stretching when thus completed?

A. It should be about 12½ per cent.

X Q. 44. This last figure 12½ per cent. represents the maximum difference in length of the sheet due to manufacturing it by stretching the bars over an operation in which the sheet is manufactured without any stretching of the strands whatever?

A. That is correct for this proportion of diamond opening that we have been considering.

X Q. 45. Does not Exhibit 18 represent the maximum amount of stretching that you have seen in a commercial sample of expanded metal?

A. It does as far as I can recollect.

X Q. 46. Will you please identify the numbers of the patents which describe and claim the machines on which Exhibits 16, 18 and 20 are made?

A. I understand that the machine upon which Exhibit No. 16 was made is fairly represented by the following patents, namely, No.

320,241, June 16, 1885, to Golding & Durkee; No. 381,230, April 17, 1888, to Golding & Durkee; 381,231, April 17, 1888, to Golding.

The expanded metal shown in Exhibits 18 and 20, is made on machines which are substantially illustrated in patent No. 581,713, of May 4, 1897, to J. F. Golding.

In giving this answer I am doing so from my own knowledge with reference to the machines employed by the Central Expanded
129 Metal Co. for making Exhibit 18, and expanded metal similar to Exhibit No. 16, and on information and belief with respect to the machines employed by the Northwestern Expanded Metal Co. in making expanded metal similar to Exhibits Nos. 16 and 20, and in fact in the making of those Exhibits themselves.

Defendant's counsel offers in evidence the patent just mentioned by the witness, namely the patent of Golding No. 581,713, dated May 14, 1897, and it is marked Defendant's Exhibit "Golding Patent No. 581,713."

X Q. 47. Do you find in the patent in suit any statement that the strands of the metal produced as described in the patent have any greater tensile strength than other kinds of expanded metal?

A. No, I do not.

X Q. 48. Is it your opinion that the claim of the patent in suit covers the use of all means or machines by which expanded metal is made by simultaneously slitting and bending portions of a plate or sheet of metal in such manner as to stretch or elongate the bars connecting the slit portions and body of the sheet or plate and then similarly slitting and bending in places alternate to the first mentioned portion thus producing the finished expanded sheet metal of the same length as that of the original sheet or plate?

A. The claim of the patent in suit is for a method, and is not directed to a machine, nor to any particular mechanical devices to be used in carrying out the method, I can only answer the question by saying that while no machine of itself would be an infringement of the claim of this patent in suit, the carrying out of the method specified in complainant's patent and recited in the claim thereof, would be included without regard to the particular character
130 of the machine which might be employed to assist the operator or person practicing the method to the patent.

X Q. 49. Prior to the patent in suit, expanded metal had been made by forming alternately arranged slits or cuts in a metal sheet, the metal being spread open simultaneously with the formation of the cuts?

A. I understand your question to refer to expanded metal and manner of making the same as disclosed in the Golding & Durkee patent No. 320,242, of June 16, 1885, and with this understanding my answer is in the affirmative.

X Q. 50. You have referred to the Golding patent No. 297,382; is that the same patent which was held to be invalid in the suit of the Expanded Metal Co. *v.* The Board of Education, reported in 103 Fed. Rep. 287, and 111 Fed. Rep. 395?

A. It is.

X Q. 51. Will you please refer to the patent of Ohl which has been offered in evidence by the defendant and compute the amount of stretching of the metal which takes place in forming the expanded or looped portions shown in Fig. 11?

A. I have made the computation asked for, and I find that the amount of stretching is about 11 per cent. In computing this I find that the length of the cut is 28-32 inches long and length of the loop is 31-32 inches, making a difference of 3-32 inches in length.

X Q. 52. What is the ordinary width of the blank used in making expanded metal on machines employed to make Exhibits 18 and 20?

A. Sixteen inches.

X Q. 53. In your answer to question 17 you say that Defendant's Exhibit "Gunz Sample Broken" was undoubtedly specially prepared sample made by hand manipulation; did you not 131 overlook Mr. Gunz's statement in answer to question 23, where he said that this sample was made on a Bliss Manufacturing Co. punching machine?

A. What I meant by that was that Mr. Gunz in the light of the invention of Golding, disclosed in the patent in suit, manipulated the sample by hand in connection with the machine that he employed for shearing the metal, so as to make that machine produce the particular sample as he desired.

X Q. 54. Skelp iron which comes in narrow widths is the material ordinarily used as blanks for this purpose, is it not?

A. I am not in position to answer that question; I don't know.

X Q. 55. You are of course testifying in this case professionally as an expert, that is I mean you are rendering expert professional services and making your ordinary professional charge therefor?

A. I am.

Cross-examination closed.

Adjourned subject to notice.

Signature waived.

PHILADELPHIA, THURSDAY, *June 14th*, 1906.

Met pursuant to adjournment at 11 A. M.

Counsel present as before.

LEWIS E. CURTIS, having been sworn, testifies as follows:

By Mr. HUNTER:

Q. 1. Please state your age, residence and occupation.

A. Lewis E. Curtis; age 42 years; Chicago, Illinois; mechanical engineer.

132 Q. 2. Are you connected with any company; if so, with what company?

A. Am connected as engineer with the Ames Steel Lath Company of St. Louis.

Q. 3. Will you state your training and experience as an engineer, particularly with reference to metal working, and expanded metal?

I have been connected with the Ames Steel Lath Co. since 1900
igning and building machines for making expanded metal,
revious to that time I had been employed as a mechanical
er in designing machinery and acting as expert in patent cases
out fifteen years.

ave been familiar with expanded metal in its various stages
1884 or 1886.

. I call your attention to two Exhibits which have been intro-
on behalf of the complainant, marked exhibits No. 16 "Full
heet Process of Patent 320,242" and exhibit No. 20, "Full Size
Northwestern Co. Process of Patent in Suit." Do you know
these sheets of expanded metal were made?

Yes, sir. At the 26th Street Works of the Northwestern
ded Metal Co., Chicago, Illinois.

. Have you made, or had made under your instructions any
f Complainant's Exhibit No. 20 to determine the increase, if
n the tensile strength of the strands due to the method of
ing that sheet?

Yes, sir.

. Will you please explain what those tests were, or what you
d state the results?

These tests were made by a representative of Robert W. Hunt
at the Armour Institute at Chicago, Illinois, in my presence
ere verified by me, and consisted in obtaining the tensile
h and elastic limit of two strands of expanded metal cut from
the sheets Exhibit Sheet No. 20, and the third sample was a
strip approximating the sectional area of the strands taken
from the sheet; but this strip was taken from a stock sheet,
that is metal before it has been passed through the process of
ling.

he first test the strand from expanded metal was used the area
02129 inches; the elastic limit in actual pounds in this strand
050 pounds; the maximum load 1,516 pounds. The test
l elastic limit per square inch of 49,320 pounds, with the
strength per square inch of 71,200 pounds.

second test was of a similar strand taken from the same sheet
nded metal and having an area of .02145 inches, showing the
limit in actual pounds 1,185; maximum load 1,484 pounds,
an elastic limit per square inch of 55,240 pounds, and tensile
h per square inch of 69,180 pounds.

third test was made with a strand of stock metal, that is a
cut from the original sheet of metal, from which the sheet of
led metal was afterwards made. This strand showed an area
24, elastic limit 638 pounds, maximum load of 902 pounds,
g the elastic limit per square inch 28,480 pounds, tensile
h of 40,270 pounds.

paring the tensile strength per square inch of the three
, it will be seen that the first test of an expanded metal
shows an increase in tensile strength per square inch over that
stock strand of approximately seventy-five per cent., while the
the second strand shows approximately sixty-five per cent.

Q. 7. To what do you understand this increase in tensile strength is due?

A. I can only say that in answer to your question that when metal is stretched to or near its elastic limit and then allowed to set, that its ultimate breaking strain is vastly increased.

134 Q. 8. Do you consider that metal, by that I mean, expanded metal similar to Exhibit No. 20, with the strands thus stretched has been rendered so brittle as to be objectionable for use in re-enforcing concrete in fireproof structures?

A. No, sir; on the contrary it is much improved.

Q. 9. Some testimony has been given in this case to the effect that expanded metal having the strands stretched in this manner becomes brittle and must be annealed. What is your opinion with reference to that?

A. In the form of expanded metal shown in Exhibit No. 20, it is not the case. If it is the case in anyone form, I am not personally familiar with it.

Q. 10. What is the practice of the Northwestern Expanded Metal Co. with reference to their expanded metal; is it annealed, or not?

A. It is not, and they have no provision made in their factory for annealing.

Q. 11. What is the effect of annealing on expanded metal?

A. The effect is to reduce the strains and softening.

Q. 12. Under what circumstances or conditions would you consider annealing advisable or beneficial?

A. When the metal has been stretched beyond the elastic limit, or beyond the critical point at which the metal hardens.

Q. 13. What is the effect of this stretching to approximately the elastic limit, and then allowing the metal to set, upon the elasticity of the metal?

A. Elasticity is nearly all eliminated.

Q. 14. In the use of expanded metal of this kind for re-enforcing concrete, is there any advantage due to the fact that the elasticity has thus been removed?

A. Yes, sir, it is found that the concrete does not crack, and this
is due to the fact that as the concrete has no tensile strength,
135 the binder or re-enforcement must have very little elasticity
to prevent the cracking.

Q. 15. Is Exhibit No. 20 an ordinary commercial sheet produced in the usual manner, or is it one specially prepared for the purposes of this case?

A. It is one prepared in my presence and is exactly like their stock sheets of that size, and was made in the usual manner.

Direct examination closed.

Cross-examination.

By Mr. Bakewell:

X Q. 16. Does the Ames Steel Lath Company make lath or expanded metal according to the patent in suit?

A. No, sir.

X Q. 17. It uses some other means or method for that purpose?

A. The Ames Steel Lath Company do not manufacture any expanded metal at all. It is the owner of certain patents for making expanded metal, and licenses others under those patents.

X Q. 18. You said in answer to Q. 3 that you were connected with that company in designing and building machinery for making expanded metal. Does the use of those machines involve the subject of the patent in suit?

A. No, sir.

X Q. 19. In the use of those machines is the metal stretched in its strands in the act of expanding the meshes?

A. No, sir; the strands are merely bent.

X Q. 20. It is well known in metal working that as a piece of steel is stretched or distorted, so as to subject it to internal stretching, that the condition of molecular stress thus occasioned produces an increase of tensile strength up to the point where the
136 elastic limit is reached, at which point the metal will snap or break. Is that not true?

A. It is. The breaking point, however, comes after the elastic limit is reached and varies considerable from that limit.

X Q. 21. And this increase of tensile strength caused by molecular stress is attended with an increased brittleness of the product and great liability to crack, is it not?

A. Yes, sir.

X Q. 22. These facts have been known for many years prior to the patent in suit, have they not?

A. I believe so.

X Q. 23. Are they not well exemplified in the art of drawing wire, in which the pulling of the wire through the dies reduces and stretches it, putting it into condition of molecular stress and rendering it more brittle, and to correct this brittleness the wire is annealed?

A. Yes, sir.

X Q. 24. The operation of annealing is one in which the metal is heated and then allowed to cool slowly?

A. Yes, sir.

X Q. 25. The effect of the annealing is to remove from the metal the condition of molecular stress and to remove from it the increased tensile strength and increased brittleness which it derived from the distortion or stretching, is it not?

A. It removes the brittleness, but I would not say that it removes all or any of the increased tensile strength, as I have never made any tests along these lines.

X Q. 26. You mean that you don't know?

A. I don't know.

X Q. 27. In making these tests which you have mentioned, the first two samples, namely, the strands of metal, were not previously annealed, were they?

A. No, sir.

137 X Q. 28. And you made no test to determine the greater brittleness and liability to crack possessed by these strands over the piece of sheet which you tested?

A. No, sir.

X Q. 29. What is the length of the cut in each of the exhibits 18 and 20, respectively?

A. The length of the cut in Exhibit 18 is six inches, while that in Exhibit 20 is eight inches.

X Q. 30. Please give the dimensions of the short diagonal of the meshes in these exhibits?

A. By diagonal I understand you to mean a line connecting the opposite corners and this in exhibit 18 is 2⅞ inches and in exhibit 20 it is 3¼ inches. All these dimensions are dimensions from center to center.

X Q. 31. Please give me the respective lengths of the sides of the meshe*d* of the two exhibits?

A. In Exhibit 18 the length of the side is 3½ inches, and in exhibit 20 it is 4 5/16 inches. These dimensions are approximately correct and are from center to center.

X Q. 32. The proportion of stretching of the metal strands in the case of Exhibit No. 20 is much less than is the case in exhibit No. 18.

A. Yes, sir.

X Q. 33. How long has the Northwestern Expanded Metal Company, been making expanded metal for concrete re-enforcement like Exhibit No. 20?

A. I don't know.

X Q. 34. They were not making it a year ago, were they?

A. I don't know, but I believe they were.

X Q. 35. When did you first see the manufacture of mesh like Exhibit 20 for concrete re-enforcement at the Northwestern Expanded Metal Company Works?

A. Probably about three months ago.

138 X Q. 36. Had you been in their Works frequently prior to that time?

A. I don't remember having been in the Works from sometime prior to 1900 until about three months ago.

X Q. 37. You are connected in business in some way with the Northwestern Expanded Metal Company, are you not?

A. No, sir; except to the extent that I have just installed a new machine for them at their new plant at Hermosa, Illinois.

Recess until half past two o'clock.

X Q. 38. From sometime prior to 1900 until about three months ago, had you seen the operation of machines operating as described in the patent in suit?

A. I stated that I had not been in the Northwestern Factory from sometime in 1900 until about three months ago. The Northwestern Company about two years ago, or perhaps three, employed me to go to Toronto, Ontario, and there make sketches of machines employed by the Canadian Expanded Metal Company. I made these sketches and afterwards made a set of complete working drawings, and the machine on which the Exhibit No. 20 was made, was built from these drawings. I did not see the machine built nor installed, nor in operation, until about three months ago. The Northwestern Company, have had a machine in operation for several years, I cannot now say how many, operating under the process of this patent and producing lath.

X Q. 39. By lath, you mean material lighter than that which was used for re-enforcing concrete, and having small meshes?

A. Yes, sir; that is expanded metal made from twenty-four to twenty-seven gauge, and the meshes about one inch long by three-eighths of an inch wide.

139 X Q. 40. This material could not be made on that machine with metal of lighter gauge than twenty-seven, without breaking an undue proportion of the strands, could it?

A. I don't know.

X Q. 41. Prior to a short time ago, when this machine of this Exhibit 20 was made, was installed, all the concrete re-enforcement made by the Northwestern Expanded Metal Company was made on machines like that which was used in making Exhibit No. 16, was it not?

A. Yes, sir; so far as I know.

X Q. 42. Very large product was made by that Company of concrete re-enforcement like Exhibit 16, was it not?

A. I presume so. Personally, I don't know.

X Q. 43. When you were in the Works prior to 1900 you saw these machines, like the machine which made Exhibit 16, turning out concrete re-enforcement?

A. Yes, sir.

X Q. 44. And prior to the time when this machine from which Exhibit 20, was made and installed at Chicago, all the concrete re-enforcement was made in the United States on machines embodying the invention of the patent in suit, was made at the works of Chess Brothers, at Pittsburg, is that not so?

A. It is.

X Q. 45. And all of their product was carefully annealed after it came from the machine and before it -as sent out on the market, was it not?

A. I understand so. Personally I have no knowledge of how the metal is made at Chess Brothers' factory, or any other factory in the United States, outside of the Northwestern.

X Q. 46. The purpose of this annealing, as you understand it, was to cure the brittleness imparted to the metal by the stretching
operation, and by restoring the metal to its original condi-
140 tion to reduce the liability of the metal to crack or break
and which would impair its usefulness. Is that not true?

A. Yes, sir.

X Q. 47. When did you first see a machine which simultaneously slit the metal sheet and expanded the strand by stretching the strand?

A. To the best of my recollection the first machine I saw of that sort was the machine in Toronto from which I took sketches, that as near as I can remember now, was in the Fall of 1903. The machine in the plant of the Northwestern Company, for making lath under this process had been in operation then for several years. I never paid any particular attention to it, and cannot say just when it was put in operation.

X Q. 48. And at the same time that this lathing machine you have mentioned was being used by the Northwestern Expanded Metal Company, it also manufactured lathing with a machine or machines like that which made Exhibit No. 16, did they not?

A. Yes, sir.

X Q. 49. Don't you remember to have seen a machine in which the metal was simultaneously cut and expanded by stretching the strands at an earlier date than you have mentioned, namely a machine that was used in Chicago in the early 90's, or prior thereto, and on which some brass expanded metal was made?

A. I don't recall having seen any machine in Chicago operating to produce metal by simultaneously cutting and stretching the metal other than the machines of the Northwestern Expanded Metal Company. I never saw any machine operating under that process and producing brass expanded metal.

X Q. 50. Don't you remember seeing such a machine in Chicago, in the early 90's?

141 A. The Northwestern machine is the only one of that sort which I recall, and I do not know just when I first saw it, except that it was prior to 1900.

X Q. 51. Don't you recall a machine that was built by Mr. Ramsey, or some one else, and was made in the early 90's or thereabouts?

A. No, sir.

X Q. 52. Doesn't it refresh your recollection if I suggest to you that such a machine was used in Chicago in the early 90's and produced material which was used for a brass railing in the office of the Northwestern Expanded Metal Company?

A. No, sir. I have seen some expanded metal made of brass, and I presume it was made by the Northwestern Company, but where, when or on what machine it was made, I never knew.

X Q. 53. Had you never heard?

A. No, sir.

X Q. 54. Sheets from which expanded metal re-enforcement was made are all annealed prior to putting in the machine, are they not?

A. Personally the only annealing I know of is that done at the mill from which the sheets are purchased, and they are the ordinary onepass cold rolled box-annealed sheets.

X Q. 55. Which being translated means that these sheets after cold rolling are annealed in boxes or muffles to take out the molecular stress imparted by the cold rolling. Is that not so?

A. Yes, sir.

X Q. 56. And the sheets come into the hands of the expanded metal manufacturer in this annealed condition, do you not so understand it?

A. Yes, sir.

142 X Q. 57. And if they were not so annealed, prior to being put into the machines, the stretching of the strands by the machine would break the strands if the machine were of the type referred to in the patent in suit, would it not?

A. I have never seen an experiment such as you suggest made, that I know of. I do not know whether it would break the strands or not.

X Q. 58. But if you take the machine on which Exhibits Nos. 18 and 30, were made and pass a sheet of metal through it and expand it therein, the necessary operation of that machine is to stretch the strands of which the meshes are composed, is it not?

A. Yes, sir.

X Q. 59. And this inevitably and necessarily happens in the use of that machine?

A. Yes, sir.

X Q. 60. Will you please give me a general description of the construction of that machine as far as its cutting and expanding mechanism is concerned?

A. The machine consists first in a suitable framework, that is uprights and bed piece. The bed piece is furnished with a long bed-knife having a straight uninterrupted cutting edge. This bed knife is opposed by movable cutters secured to and moving with the cross head mounted so as to slide in the uprights of the machine, motion being given to it by eccentrics and connections from the power shaft. The lower or cutting surface of these movable knives is fashioned so as to produce one-half of a mesh at each stroke of the machine.

X Q. 61. The moving knives of the machine are arranged in straight line above and parallel with the long bed knife?

A. Yes, sir.

X Q. 62. Will you now please give a similar description of the construction of the cutting and expanding mechanism of
143 the machine on which Exhibit No. 16 was made?

A. In the machine upon which the sheet Exhibit 16 was cut, the lower knives instead of being long and straight-edged are individual knives and offset one from the other this offset being equal to the width of the strand desired to be cut. The movable knives carried by the cross head are similar to and set in position the same as the lower or bed knife. The metal to be cut in this case is fed parallel with the face of the bed knife and as the bed knives are opposed by the movable knives the bed knives move longitudinally, so that they pass one another in cutting and opening the metal.

X Q. 63. Will you make a pencil sketch showing in plan view the arrangement of the bed knives in that machine?

A. Yes, sir.

(The witness makes such a sketch and it is marked Defendant's Exhibit, "Curtis Sketch, June 14th, 1906," and Defendant's counsel offers said sketch in evidence.)

X Q. 64. In the operation of the machine indicated in your sketch on which machine Complainant's Exhibit 16 is made, and in the operation of the machines on which Complainant's Exhibits 18 and 20 were made, the cuts in the metal sheets are arranged alternately or in staggered relation in successive rows and are parallel to each other, and to the edge of the sheet, are they not?

A. Yes, sir.

X Q. 65. And in the operation of the machine shown in your sketch, with which Exhibit 16 was made, the staggered location of the cuts is produced by reason of the oblique and staggered arrangement of the knives, while in the machine on which Complainant's Exhibits 18 and 20 were made, the staggered location of the cuts is caused by shifting the sheet on the bed knife, or shifting the movable knives between each successive cut, is that not correct?

A. It is.

144 X Q. 66. And the machine in your sketch operates necessarily to produce the kind of metal represented by Complainant's Exhibit No. 16, whereas the other machine operates necessarily to produce the kinds of metal represented by Complainant's Exhibits Nos. 18 and 20, is that not correct?

A. They both produce respectively metal such as shown in the Exhibits 16 and 18.

X Q. 67. Then am I to understand that your answer to my last question is "yes"?

A. With the present arrangement of knives and feeding mechanism, yes.

X Q. 68. In the practical operation of the machine on which Exhibit No. 18 or Exhibit No. 20, is made, there is a certain part of the metal blank which must be sheared off at the end of the operation, as a selvedge edge, is there not?

A. Yes, sir.

X Q. 69. What is the width of this sheared off strip, or selvedge edge?

A. The width of this strip varies, but I have seen it as small as one-half inch.

X Q. 70. And what is the average ordinary width of this discarded strip?

A. I have never paid any particular attention to it, so I do not know the average width. If the original plate was always of a given size, and the expanded metal product was in uniform sheets the selvedge edge could be, and I see no reason why it should not be, very narrow and of uniform size.

X Q. 71. What is your best judgment as to the average width in products of this discarded or selvedge edge?

A. My answer at best to your question can only be a guess. I should say between an inch and an inch and a half.

145 X Q. 72. The reason for the presence of this selvedge edge in this machine, is that in the machine the sheet is gripped by the pressure bar while it is being cut, and the selvedge edge represents the gripped portion at the last cut?

A. It does.

X Q. 73. What is the ordinary size of the blanks treated in this machine?

A. I have never measured them, and do not know.

X Q. 74. Will you please measure and state the dimensions of the blanks which are in evidence?

A. The blank here in evidence is eight feet long, by 14⅞ inches wide.

X Q. 75. This selvedge edge of which you have spoken extends entirely along the longer dimension of the blank, does it not?

A. Yes.

X Q. 76. Therefore if the average selvedge edge is from one to one and a half inches in width, it results that the discard in the blanks which you have measured would be from ninety-six to one hundred and forty-four square inches, would it not?

A. Yes, sir.

X Q. 77. Or expressed in another way it would be from about 1/15 to about 1/10 of the entire area of the blank?

A. Yes, sir.

X Q. 78. In the blank which is treated in the machine used to produce Exhibit No. 16, the discard is at the ends of the blank and extends along the narrowest dimension instead of extending along its longer dimension and forms two triangles, one at each end of the blank?

A. Yes, in cases here the finished product is desired to be absolutely square.

X Q. 79. Will you make a sketch of the blank treated in the machine in which Exhibit 16 was produced, and mark on this sketch the triangular portions which are eventually sheared off in
146 order to produce a square sheet of expanded metal.

A. I have done so and have marked the triangular portion at the end of the blank which are eventually sheared off where a square sheet is desired.

Defendant's counsel offers in evidence the sketch just made by the witness, and it is marked Defendant's Exhibit "Curtis Sketch No. 2, June 14th, 1906."

X Q. 80. Will you state about the length of the base of these discarded triangles shown in your sketch?

A. As these triangles are always cut from the finished product and always vary according to the width of the finished product, I cannot say how much would be cut from the original blank in order to make a square sheet of finished product, and as all these answers as to size and shape, width margins, etc., are only guesswork on my part, I shall have to answer this question in the same manner, so therefore assuming width of the blank to be seven and a half inches I showed the base of the triangle to be cut therefrom would probably be somewhere in the neighborhood of one inch.

X Q. 81. Taking as approximately correct, the figures which you have given for the discard of the product of the two machines, namely a discard of one to one a half inch wide and eight feet long from the blank to be treated in the machine on which Exhibit 18 is produced, and a discard consisting of two triangles of one inch by seven and a half inches in dimensions, in the machine producing Exhibit 16, the discard from the blank of the latter machine will be seven and a half square inches in a seven and a half inch wide sheet, and from ninety-six to a hundred and forty-four square inches in a 14⅞ inch wide blank in the case of the machine producing Exhibit No. 18 or No. 20, is that not so?

A. Assuming the figures to be correct, it is so, however, 147 from the blank 8 feet long by 14⅞ inches wide, several sheets of expanded metal are made while from the blank used in the old machine, only one sheet of expanded metal is made.

X Q. 82. The difference in the number of sheets being in proportion to the relative widths of the two blanks, is that not so?

A. In this particular case it is not so, the 7½ inch blank only making a sheet three feet and one half wide by eight feet long. The blank, however, in this case is about sixteen per cent. longer than the finished product, while the finished expanded metal to be made from the 14⅞ inch blank is approximately one foot of expanded metal for every one and one-eighth inches of the width of said blank. The finished product being of the same length of said blank. The proportion of waste or marginal waste matter in the fourteen inch blank can be largely reduced as I have before stated, by making certain width sheets of expanded metal from a given width of blank.

X Q. 83. But the discard in the case of the machine for Exhibit 18, is larger than for the other machine?

A. I believe it is.

Cross-examination closed.

Redirect examination.

By Mr. Hunter:

R. D. Q. 84. I understand from your cross-examination that prior to 1900 the Northwestern Expanded Metal Company, was using the process of the patent in suit in making lathing and was using the process of patent 320,242, in making metal for concrete re-enforcement, and that two or three years ago at the request of the Company you went to Canada for the purpose of examining the machine 148 of the Canadian Expanded Metal Company operating under the new process for making concrete re-enforcement for the purpose of preparing drawings for the construction of a machine similar to that Canadian machine for the Northwestern Company. Is my understanding of your testimony correct?

A. It is.

R. D. Q. 85. I also understand that you prepared such drawings and that the machine was constructed from them, and that is the machine which you saw in operation at the 26th Street plant of the Northwestern Company and upon which the Exhibit No. 20, was made. Is that correct?

A. That is correct.

R. D. Q. 86. And is that machine upon which Exhibit No. 20, was made similar to the Canadian machine?

A. It is practically identical.

R. D. Q. 87. Do you know whether the Northwestern Company has under construction, or is preparing to construct, other machines similar to this one upon which Exhibit No. 20, was made?

A. Yes, sir; one larger machine, one smaller one, and one lath machine.

R. D. Q. 88. Do you know what they are doing with the machine upon which Exhibit No. 16 was made?

A. I understand that it is to be put in scrap. The General Manager has so informed me.

R. D. Q. 89. Do you know whether the Northwestern Expanded Metal Company has any other machines for making concrete re-enforcement under the old process besides this machine upon which Exhibit 16 was made and which you understand is to be broken up.

A. I do not know of any other.

149 R. D. Q. 90. While you were in Canada I presume you saw the Canadian machine in operation and became familiar with their practice, is that correct?

A. Yes, sir.

R. D. Q. 91. Does the Canadian Company anneal the expanded metal for concrete re-enforcement made on their machine?

A. I do not think they do, as I believe it to be wholly unnecessary in their product, and also because I have seen the product shipped direct from the machine.

R. D. Q. 92. You say that the sheets or blanks from which expanded metal is made by the process of the patent in suit are annealed, that is annealed by the manufacturer before they are expanded. Does this apply to sheets of all thicknesses?

A. Personally I do not know whether it does or not. I know that it applies to the light gauges used in making lath, whether the heavy gauges are box-annealed, one-pass, cold-rolled, or common ordinary skelp, I do not know.

R. D. Q. 93. Considering Complainant's Exhibit No. 16, when you cut off the short triangular pieces at the ends does it not make the sheet an irregular parallel-gram and not a rectangle?

A. These triangles are cut from the finished product to make the sheets square. In the manufacture of lath under the old process the shape of the knives is such that the mesh produced is a long narrow one and in the manufacture of this lath having meshes of the character just described the product when it leaves the machine is not square upon the ends and triangles are cut from each end of the expanded product, while in a machine operating under this old process for making concrete re-enforcement the knives are formed so as to produce meshes diamond shape in form, and as this product leaves the machine square or substantially square upon its ends it needs not be squared.

150 R. D. Q. 94. In the last part of your answer referring to the old process for making concrete re-enforcement are you referring to material like Exhibit 16?

A. Yes, sir.

R. D. Q. 95. When you speak of such sheets as being square do you mean that their outer edges or boundaries are rectangular?

A. Yes, I mean that the ends of the sheets are at substantially right angles to the sides.

R. D. Q. 96. And you are not referring to the location of the meshes in lines at right angles to the outer edges?

A. No, sir; I am referring to the margins of the sheet.

R. D. Q. 97. And in a sheet of that kind if you trim the edges so as to make the margins parallel with the lines of the rows of meshes, would or would not the resulting sheet be rectangular?

A. If the sample sheet Exhibit 6, were trimmed upon its ends parallel with the meshes across the sheet the ends of the sheet in thas case would not be at right angles to the sides of the sheet.

R. D. Q. 98. Can you produce the original reports of the test made at the Armour Institute for the purpose of determining the increase in the tensile strength of the strands in Exhibit 18?

A. I produce it.

Complainant's counsel offers in evidence the report produced by the witness, and the same is marked Complainant's Exhibit No. 23, "Report of Hunt Tests."

Re-direct examination closed.

Recross-examination:

R. X Q. 99. Do you know whether or not the Northwestern Expanded Metal Company, has successfully manufactured and 151 sold for a number of years the product as exemplified by Exhibit No. 16, said product having been made by the same machine as produced, Exhibit 16?

A. It is my understanding that they have.

R. X Q. 100. That is to say that the machine which made the Exhibit 16, for re-enforcing concrete, has been in use a number of years, and is probably worn?

A. Yes, sir.

R. X Q. 101. Isn't is also the tendency to use metal of a heavier gauge than this machine was built to produce?

A. I think that is probably so.

R. X Q. 102. You have spoken of knives of a different shape being used to produce lath from those made to produce concrete re-enforcement. Isn't it a fact that the knives are substantially the same shape, but in the case of making lath, they are arranged so that they don't move as far downwardly as in the case of concrete re-enforcement?

A. I think you are probably right. It is so long since I have examined them that I am not very clear upon that.

R. X Q. 103. Isn't it necessary in the treatment of this light metal which is used to make the lathing material to shorten the distance of the travel of the knife because the light material will not stand the strain of being opened out the longer distance?

A. That is a question of practice in the operation of those machine and one with which I am not at all familiar.

Re-cross-examination closed.

Signature waived.

Defendant's counsel objects to the testimony given by the witness, Curtis, regarding the experiments made by him as stated in answer to Question 6 and the Exhibits offered in connection therewith, on the ground that said experiments were *ex parte* and that no notice thereof was given to defendant.

Adjourned to Friday, June 15th, 1096, at 10 A. M.

152 In the United States Circuit Court, Eastern Division of the Northern District of Ohio.

THE EXPANDED METAL COMPANY
v.
THE GENERAL FIREPROOFING COMPANY.

In Equity.

Met pursuant to notice and by agreement at 926 Walnut Street, Philadelphia, on Tuesday, September 18th, 1906, at 11 A. M.

Present: Mr. Ernest Howard Hunter for complainant. Mr. Thomas W. Bakewell, for defendant.

JOHN F. GOLDING, recalled as a witness in rebuttal, testifies as follows:

By Mr. HUNTER:

Q. 164. You have already been sworn in this case and have testified on behalf of the complainant on direct?

A. I have.

Q. 165. Have you read the depositions of Oscar F. Gunz, William F. Kearns, Julian Kennedy and Herbert E. White, given on behalf of the defendant, and have you examined the various exhibits referred to in said depositions?

A. I have, and was present at the time of their giving the depositions.

Q. 166. Regarding the Ohl patent 475,700, which has been referred to by some of the defendants' witnesses, will you please point out wherein the process claimed in your patent 527,242, 153 differs from any process or method which may be described in the said Ohl patent, and give your reasons for any disagreement which you may express with the opinions of any of the defendant's witnesses?

A. The Ohl patent relates to the art of making a series of depressions by cutting, bending and stretching the parts forming such depressions without in any manner otherwise affecting the size or shape of the original length of the sheet or plate, whereas the patent in question describes and claims the process of making open or reticulated metal work by simultaneously slitting and bending portions of the plate or sheet of metal in such a manner as to stretch or elongate the bars connecting the slit portions and body of the sheet or plate, and then repeating the operation and producing a finished sheet of expanded metal not only maintaining the original length of the sheet but greatly enlarging it in the opposite direction, thus forming what is known as a sheet of expanded metal.

This sheet of metal being connected throughout by its stretched portions, and as described in the specification, these operations are performed first upon one edge of the sheet of metal to form the requisite width of the strand, and upon the portions lying outside of the cuts, then upon another portion of the metal lying outside of the line next cuts. All of the cut, stretched and bent metal and the connecting metal between them is forced away from the original plane of the metal; in each case the width of the strand is immediately back of the preceding cut, and each cut is made upon one side of each strand in each operation, whereas in the Ohl patent the cuts are made necessarily on both sides of each strand and at some distance away from the adjacent rows of loops or depressions, as otherwise the whole sheet would be cut up in strips. This act as described in the patent in suit, wherein the metal forming each strand is itself projecting over a lower cutting blade and is
154 simultaneously cut, bent, and stretched from the plane of
the sheet, is not performed in the Ohl patent, nor in any of my previous patents, nor in any of the patents offered in evidence in this case.

Referring to the testimony of Mr. Gunz, in answer to question 22, he first produced a sample sheet of what he terms "Bostwick metal lathing" upon a machine identical with that upon which he produced a sample of expanded metal, but he states in his testimony that for each loop or depression in the Bostwick lathing he used two lower cutters and one upper cutter, the upper cutter cutting upon both its sides against the two innermost faces of the two cutters, and that when he made the small sample of expanded metal that he removed one of the lower cutters and operated with only one cutting side of the upper cutter, hence he by two different machines produced two different articles, the first or Bostwick lathing remaining flat with loops or depressions within the sheet, and the other the expanded metal being all transformed into meshes, having a much greater area than the original sheet, and this last act he performed by first making one row of cut, stretched, and bent metal, and then the succeeding row of cut, bent and stretched metal, the whole sheet at right angles with its original plane. In his making of the sample of the Bostwick lathing the making of one row of depressions had no effect upon the other or adjacent row of depression because they were distant from each other. This witness also gives some statements respecting the demerits of metal which has been stretched for use in concrete work. This statement is met by the well known practice of twisting bars as is done in the Ranson patents, and by the makers of expanded metal throughout Europe, and in the United States, who in all cases employ the stretched metal exactly as it comes from the machine with the exception of the Central Expanded Metal Company, of Pittsburg, who anneal their sheets of their manufacture because of the fact that they excessively stretch their
155 metal, the difference between the expanded metal made by
all other parties and the Central Expanded Metal Company, of Pittsburg, is illustrated by samples No. 18 and 20, the former made by the Central Expanded Metal Company.

As to the testimony of Mr. Kennedy, in his answer to X Q. 34, he says: that the process described in the patent in suit is similar to the Ohl patent in so far as the slitting, bending, and stretching simultaneously are concerned. I admit this, but in no case does this bending, slitting and simultaneously stretching occur in succeeding steps and adjacent to each other. And in answer to X Q. 35, he admits that the process he employed in making the Bostwick lathing on the Ohl machine will not produce succeeding rows after the first row as is contained in the question, and in answer to X Q. 36, "and could not do it?" Answer: "No." Mr. Kennedy testifies that he has never seen any machine working under either of my patents, and consequently confuses the operation of the earlier processes with the one in suit.

Mr. White lays great stress apparently upon the great percentage of stretching manifest in the depressions made in the sheets of metal under the Ohl patent, but as before stated, he does not undertake to show that the steps necessary to make expanded metal were followed in the act of cutting, bending and stretching. In fact the defendants have produced a sample of the Ohl lathing which is simply a sheet of metal having depressions within it as previously described.

Q. 167. Some of the defendants' witnesses have stated in effect that there is no advantage in the increase in tensile strength produced by the stretching of the strands which takes place under your process of patent 527,242, because such stretching produces brittleness, and they have stated that annealing is resorted to to remove such brittleness; what have you to say with reference to this?

156 A. Very early in the practice of making expanded metal by the process in suit, and while I was in England, I desired to know what the effect of cutting, bending and stretching, was upon the ultimate strength of the strands forming the sheet of expanded metal, and for this purpose I requested the foreman of our works at West Hartlepool England, to send me a sheet of metal partially expanded into complete meshes, and with other parts of the same plain sheet serrated by a planing tool but left in the original plane of the metal. On receipt of this I sent it to a testing station in London, Kirkaldy & Company, with the request that the cut and stretched metal be tested as to tensile strength and also those parts of the sheets remaining flat and all reduced to the same sectional area. The report showed an average of nearly 20 per cent. increase in ultimate strength of those parts which had been acted upon by the expanded metal machine over those which had remained flat in the sheet. At that time we were not able to get the uniform soft quality of steel which we now employ, and hence the very great advantage in the expanded metal tested and reported by Robert W. Hunt & Company, of Chicago, and also of their test made in Pittsburg, wherein the percentage of increased strength of the metal acted upon by the expanded metal machines is at least over 50 per cent. in ultimate breaking strain, that is above the strength of similar sections of steel not bent and stretched, and in both cases there is shown the large remaining percentage of ductility, so that the

metal used in concrete may be materially further stretched before disrupting.

As before stated none of the factories making expanded metal either in Europe or the United States anneal their metal for use in concrete re-inforcement excepting the Central Expanded Metal Company, in Pittsburg, who do anneal it because of the excessive stretching which they give to the strands, that is to say they will
157 produce what is known as a 3-inch mesh from an incision
in the metal of six inches in length, whereas what is known as the 3-inch mesh made by the Northwestern Company of Chicago, and by all of the European factories, the incision is 8 inches in length. It is consequently only when excessive stretching is done that annealing is required, and as a proof of the test made metal as made by the Central Expanded Metal Company, where metal even with the excessive stretching is better unannealed, but they as makers of expanded metal were evidently unaware of this until the tests were made. They got in the habit of annealing their metal in the early stages of manufacture when they could not command uniform soft steel, which is now generally available.

Q. 168. You have expressed an opinion that expanded metal having stretched strands according to the process of your patent 527,242, would be better unannealed even when stretched to the extent present in the 3-inch meshes made by the Central Expanded Metal Company. Please explain why unannealed metal would be better?

A. It is better for re-inforcing concrete for the reason that when such concrete is subjected to loading, the metal as a tensile chord to resist the strain as will be understood by comparison with very soft metal which latter would more freely stretch, permitting a floor slab of concrete to bend and crack.

Q. 169. You have stated that metal such as is described in the Ohl patent, or Bostwick lathing, is not expanded metal; do you know how the name "expanded metal" originated? If so, please state.

A. The name "expanded metal" was conceived by members of the parent Expanded Metal Company in 1885. Oscar Bradford its President, I believe was first to advocate the adoption of the name. We deemed it essential to adopt a name which as nearly as possible
described the article which I first produced and called slashed
158 metallic screening. We were not advised, at the time, that
we could not copyright such a name for expanded metal because of the name being descriptive of the article, and it was many years after we adopted the name and established quite a large trade in it for lathing steel that some of the other makers of steel lathing adopted the name expanded metal.

Q. 170. So far as you know, did the name of "expanded metal" have any existence in the art of metal working before it was adopted by the Parent Company at the suggestion of Mr. Bradford?

A. There was no article of manufacture known by any such name prior to its suggestion by Mr. Bradford.

Recess until two o'clock.

Q. 171. Please give a history of the commercial development of the art of making expanded metal prior to the adoption of the process described in your patent 527,242, in suit?

A. Expanded metal was not made commercially until after the invention of the Golding & Durkee process and machine No. 320,242 and 381,231. At that time the use of expanded metal as a concrete reenforcement was unknown, and the manufacturers licensed under the patents last named undertook to dispose of the products of the machines for fencing and other like purposes, but with very indifferent results, but I found that I could make lathing upon these machines by simply lessening the stroke of the upper blade and after the machines had been so adjusted, they were run almost continuously on lathing and there are two machines, or three, in the United States just now still producing such lathing, but all of the machines with the exception of one, which is sometimes operated, for making light concrete reinforcement, have been abandoned. Almost exactly the same results occurred in England, into which country
I introduced the patents about the time of their issue in this
159 country. I mean I introduced the machinery there, and with
the exception of lathing it was there found unprofitable to make expanded metal by this early process.

It was not until about 1891, that I found use for expanded metal for concrete reinforcement. For this use a considerable quantity was sold and has continued to be sold until recently for a short span light concrete work, or for bonding concrete in long spans where the concrete was further reinforced by round steel rods, it not being possible by the machinery built to carry out the process of patent 320,242 to make expanded metal of sufficient strength to carry long span concrete work. We never could use steel plates of above a sixteenth of an inch in thickness. This was due to the necessary shape of the cutters, causing them to be thin at one point, and for the further reason that part of the metal to be slit had by this process already been cut away from the plane of the plate, and only a thin wide strand would maintain itself in position while such slitting was made. All of the machines in England working under patents corresponding to my American patent 320,242, and 381,231, have been abandoned, and none were ever introduced into any of the Continental countries of Europe, nor could we succeed in introducing them there, because of the very limited use developed for expanded metal in England or America, but there are at this time about thirty machines in Europe built under patents corresponding to the process in suit in patent 527,242.

Q. 172. Will you now give the history of the commercial development of this art since the adoption of the new process described in your patent 527,242, up to the present time?

A. After making the invention covered by the patent in suit and applying for the patent thereon, I introduced it into England, and formed a company and repurchased the rights of the patents I form-
erly sold, and then removed the operative parts of the machines
160 and applied such parts as would be necessary to carry out
the new process, that is by using such a machine as we form-

erly had. While I was doing this the Northwestern Expanded Metal Company, at Chicago, employed a draftsman to design a machine to carry out this process, and such a machine was built by Long and Alstat, Hamilton, Ohio. The machine built by the Chicago Company was very different from the machines which I rebuilt in England, but it carried out the process successfully, and the machine is still in operation. On my return from England, and making known to my associates, the mechanism which I had designed, they considered it better to patent these than those represented in the machine built for them by Long & Alstat. It was about two years following my application for the process patent in suit that I applied for a patent upon the machine described in patent 581,713.

The American and English Companies have been very successful in the practice of the patent in suit. They have been enabled to make most satisfactory small mesh lathing from 26 gauge steel, and all sizes of meshes and thicknesses of metal desired up to large meshes from steel about a half an inch in thickness, and the finished plates having regular margins and having intersections always at right angles to each other. The strands of the metal are of uniform width and the metal has found great uses for all kind of lattice work. There is sufficient amount of demand to-day for expanded metal for uses other than lathing for concrete reinforcement to employ a number of machines, and such metal for such other purposes is being made by the Eastern Expanded Metal Company, at Boston, Central Expanded Metal Company, at Pittsburg, and the Northwestern Expanded Metal Company, at Chicago. The advantages of the metal as now made for concrete work when compared with the best possible result to be obtained by former
161 processes is clearly evident when the two are compared. The
irregularity resulting from the old method which was simply slitting and bending gave an irregular width of strand and irregular or bent lines throughout the sheet, whereas the new had a uniform amount of metal in each strand and the lines were straight in the direction of the strains that are imposed upon them when used in concrete work, besides our ability to produce expanded metal from very heavy or thick plates enables us to sell it for the reinforcement of heavy concrete floor slabs of long span such as was not possible otherwise.

Q. 173. How extensive, or how large, are the sales of expanded metal made according to your process of patent in suit at the present time?

A. As nearly as I can estimate about 10,000 tons per annum.

Q. 174. Does that apply to this country only?

A. That applies to that only made in this country.

Q. 175. How extensive is the manufacture abroad, do you know?

A. I should estimate the amount made by foreign companies to be somewhat larger in the aggregate than the amount made in this country.

Q. 176. It has been suggested by some of the defendant's witness that the great increase in the use of expanded metal since the date of the patent in suit has been due to the increase in the building of concrete structures using metal reinforcement and not in any way to any improvement due to your patent? What have you to say with reference to this?

A. So far as this country is concerned a very limited amount of concrete reinforcement was done prior to the introduction of expanded metal in concrete, that is in reinforcing slabs of concrete.
Ransom had done considerable in the way of reinforcing
162 girder and columns with twisted steel rods, but I believe that
reinforced concrete systems prior to the early nineties in this country was more unpopular then otherwise, and I also believe that because of the great convenience in laying expanded metal sheets in concrete flooring awakened the engineers and architects to the possibilities of reinforced concrete to a greater degree than anything that has occurred in this country at that time.

Since then a great many other forms of metal work have been applied to reinforcing concrete, and I have no doubt that because of the general agitation in favor of reinforced concrete has materially advanced the sale of expanded metal.

I am certain that had I not invented the process of patent No. 527,242 in suit, and had concrete construction made the strides which is manifest to-day, expanded metal would have played a very meagre part therein, because of a limitation upon and imperfections of the expanded metal prior to the patent in suit.

Q. 177. Have you read the opinion of Judge Dallas of the Circuit Court of Appeals for the Third Circuit in the appeal of Bradford, *et al.*, against the Expanded Metal Co., *et al.*?

A. I have.

Q. 178. In this opinion, in describing the invention claimed in patent 527,242, Judge Dallas uses the following language:

"The subject of the invention as declared in the specification is 'a new and useful improvement in the art of expanding sheet metal'; and the precise improvement which the applicant asserted that he had made was the simultaneous cutting and opening or expanding the metal at the cuts by stretching the severed portions. In other words he applied for a patent upon a method of manufacturing and as will appear from the specification which we are about to quote,
he distinctly limited the novelty of his method to the stretch-
163 ing of the severed portions at the time when the metal was
cut and the slits were opened."

Is this in your opinion, a correct statement of your invention, as the same is described in your patent 527,242?

A. It is an incomplete statement, in that the claim in the patent sets forth that it consists in simultaneously slitting and bending the portions of the plate or sheet of metal in such a manner as to stretch or elongate the bars connecting the slit portions and the body of the sheet or plate, and then *similarly* slitting and bending in places alternate to the first mentioned portions, thus producing the finished expanded metal sheet of the same length as that of the original sheet or plate, substantially as described, and the description given in the specification of the patent is something more than a sheet having cut, stretched and bent portions.

The invention was in the mind of the patent examiner, obviously something more that that, and hence he suggested the claim of the patent in suit.

Q. 179. Would the act of simultaneous cutting, bending and stretching metal necessarily produce expanded metal?

A. No, that act is performed on metal for many purposes; it can be seen in the narrow strips of metal which are cut, bent and stretched open to form one row of loops, through which the upright bars of a bird cage are passed. It is sometimes done for forming a loop like as seen in the Ohl lathing.

Q. 180. Then, if the act of simultaneous cutting, bending and stretching metal does not necessarily produce expanded metal, what act or acts, in addition to the mere simultaneous cutting, bending and stretching, are necessary to produce the result?

A. Exactly what the patent expresses in the claim of the specification, and then similarly slitting and bending in places alternate to the first-mentioned portions as described in the specification of the patent to produce expanded metal. 164

No other such act of similarly slitting, bending and stretching is manifest in any other patents preceding the one in suit, nor had there been produced thereby an article in any way similar to expanded metal.

Q. 181. Then, as I understand you, the art of making expanded metal described in your patent does not consist in the mere simultaneous cutting, bending and stretching metal strands, but in the repetition or succession of those acts in a certain relation or position with reference to one another, and with reference to the sheet or material being acted upon; is that your meaning?

A. That is exactly my meaning.

Q. 182. And will you please explain more fully, by reference, if you desire, to the specification of the patent, the particular relation or point of application of these successive acts with reference to one another, which is necessary to produce expanded metal?

A. The words "and similarly slitting and bending in places alternate to the first-mentioned portions" contained in the claim, apply to making a series of slits in a straight line across the edge of the sheet, and at the time of cutting the slit, and as a continuation of that operation to depress the severed metal, *i. e.* portions of the sheet lying outside of the cuts, in a direction at right angles to the sheet, as expressed in the specification beginning of line 35 of page 1. I would like here to call attention to the fact that those portions of the metal which are slit and depressed in the Ohl lathing are always within the line,, and for the purpose of making such Ohl lathing might be positioned at any place within the surface of the sheet, so long as there were undepressed parts remaining. Begining at line 43 of page 1 of the specification of the patent in suit. it is further expressed that this operation is then repeated after the sheet has been fed forward, and this is illustrated by Figure 1 of the drawing of said patent, the slits being made opposite 165 to the portions unsevered at the previous operation, and so on until the entire sheet is expanded, whereas no portion of the sheet can be properly said to be expanded under the Ohl patent, and I certainly must take exception to Mr. Kennedy's assertion that the area of the sheet is increased by the operation of the Ohl machine. There is simply the exposed edges of the cut parts, which could be measured as an increase of surface area or the elongation of the depressed part, which in no way affects the size of the original sheet.

Q. 183. Was the invention by you of a machine for carrying out the process of patent 527,242 on a commercial scale simultaneous with your invention of the process?

A. It was not. I made a number, probably eight or ten, specimens, some in steel and some in gold, according to the process of this patent, using a cold chisel formed at its cutting edges similar to the cutters in Figure 2, as shown in the specification 527,242, and I afterwards made a gang of such cutters in one piece of steel almost identical with Fig. 2 of the last-named patent, and affixed such cutters in a small iron shearing machine, and produced a number of samples. I next took away the operating parts of an old expanded metal machine and put in their stead cutters such as are now used, and after determining the proper shape of these cutters I applied to such machine the necessary feeding apparatus, and an apparatus for shifting the metal until I had created one kind of a working machine. I did not regard this as altogether complete for some time before my application for a machine patent, but as before stated during that time the Northwestern Company was building a machine and which is now operating practically at present.

166 Q. 184. After your process patent 527,242 was issued, did you show it to any persons interested in the expanded metal business?

A. The patent when applied for was assigned to the Expanded Metal Company, of Missouri, the officers of such company being fully cognizant of the subjects contained in the application.

Q. 185. Did any of those persons connected with the Expanded Metal Company to whom your patent or application was disclosed, so far as you are aware, have any difficulty in understanding the improvement in the art which is described in that patent?

A. None of them at all, but some of them had such bad luck with expanded metal that they hesitated to build new and different machinery from that which they were using.

Q. 186. You have said that the Northwestern Expanded Metal Company proceeded to construct and did construct a successful machine for producing expanded metal according to the process of the patent in suit; from what soure did they derive the information to enable them to build that machine?

A. Before I left this country to introduce this new process work in England I left with Mr. Julius Seibel, foreman of the Northwestern Expanded Metal, of Chicago, rough, free-hand sketches of the kind of cutters I thought would be best to employ in the machine, and I showed him the small samples I had made in the works of the Northwestern Company. However, Mr. Bradford, the president of the company, after my departure, employed a mechanical draughtsman to design a complete machine—the one before referred to as having been built by Long & Alstat, of Hamilton, Ohio. Such machine was different in every way from the machine which I built and patented, except as to the cutters. I also believe that before the machine last referred to was put into successful operation, and 167 after my return to this country, I had further talks with Messrs. Chess Bros., of Pittsburg, and who soon thereafter began the erection of a large machine in many ways following the suggestions I had made to them as to the manner of feeding the metal and shifting it.

Q. 187. So that, as I understand the matter, machines substantially different from that described in your patent 581,713, have been made and successfully operated for producing expanded metal according to the method described in patent 527,242, is that correct?

A. It is correct.

Q. 188. And the machine of your patent 581,713 was not invented by you until some time after the invention of the process of patent 527,242; and in fact, not until after a different machine capable of carrying out the process had been made by the Northwestern Expanded Metal Co.; is that correct?

A. A machine made by the Northwestern Expanded Metal Company was nearly finished before I made known to anyone in this country the mechanism which I employed in the machine, and no part of the mechanism which I employed were put into the machine made by the Northwestern Company, that is, except such as is described in my process patent, in suit.

Q. 189. With the experience that you have had in the building of machines for making expanded metal, would any skilled machinist, in your opinion, have any difficulty in designing a machine from the information given by patent 527,242, to enable the process described in that patent to be carried out upon a commercial scale?

A. They would have no difficulty in building a variety of machines to carry out the process.

Adjourned to Wednesday, September 19, 1906, at 11 A. M.

168 PHILADELPHIA, WEDNESDAY, *Sept.* 19, 1906.

Met pursuant to adjournment at 11 A. M.
Present as before.

Defendants' counsel objects to that portion of the witness' testimony which relates to acts done in Europe by others, and also the reference to the acts of the witness himself alleged to have been performed in Europe, on the ground that this testimony is irrelevant and incompetent.

Defendants' counsel also objects to question and answer 178, in which the witness criticizes the decision of the Circuit Court of Appeals for the Third Circuit in the suit of the present complainants against Bradford and others, as being incompetent and improper.

Defendants counsel also objects to the questions and answers 185, 189, as being hearsay and incompetent, and a like objection is made to the testimony of the witness relating to tests alleged to have been made of expanded metal.

The entire deposition is objected to in view of the decision of the Circuit Court of Appeals above referred to, in which the patent in suit was held to be invalid.

Direct examination closed.

Cross-examination:

By Mr. Bakewell:

X Q. 190. Notwithstanding your testimony in the direct examination, is it not a fact that the product of the machine of the Ohl lathing has a superficial area which is greater than that of the
169 original unslit and unstretched blank? In other words, does
it not have a greater surface area, by reason of the stretching?

A. The surface area of a sheet is not enlarged in either direction of length or width of sheet, but whatever increase there is of surface area is due to the elongation, and confined to the portion stretched.

X Q. 191. Will you now please answer my question?

A. If you mean by surface area a greater length and width of sheet, my answer is, no; and if you mean a greater area because of certain parts of the sheet having been depressed from the plane of the sheet, my answer is, yes; in so far as the metal is elongated at the point of such depression.

X Q. 192. In your deposition given for complainant in the suit of the present complainant against Bradford, which was recently decided by the Circuit Court of Appeals, you said:

"I had determined in my own mind that expanded metal could not be a commercial article until I could devise a machine which would both cut and open the metal in a single operation; and this I discovered could be done by the methods which I described in my patent No. 320,242, patented June 16th, 1885, and I devised the cutting mechanism in a machine as described in patent 320,241, patented June 16th, 1885, and in which patent I was joined by George B. Durkee."

Did you not so testify?

A. I believe your quotation is correct.

X Q. 193. And it is true, is it not, that in the operation of the machine of patent No. 320,241, the metal sheet is both cut and opened in a single operation?

A. It is.

X Q. 194. And it is also true that in the operation of said machine,
the slits in the metal sheet are in parallel rows, parallel with
170 the edge of the sheet, and the slits of adjacent rows are staggered, or break-joint, relatively to each other?

A. In patent 320,242 the cuts are always in step form, not in the same line, but in different lines. All of the lines of the cuts made in cutting and opening the metal are in step form at each stroke of the machine. A straight line drawn through a line of any series of cuts is not on a straight line with the sides of the sheet operated upon, but each following cut is made on lines parallel to the preceding cut, but a line drawn through such last line of cuts is also not parallel to the sides of the sheet.

X Q. 195. I understand your last answer to state in effect that in the operation of the machine of your patent No. 320,241, the metal is slit in rows of slits which are parallel to each other, and that the slits of each row are staggered, or break-joint, relatively to the slits of the adjacent row?

A. They are not on the same parallel line with the preceding cut, but on different lines, each cut therefore being parallel to the corresponding preceding cut.

X Q. 196. But the cuts finally produced are in parallel rows, and each cut is staggered relatively to the cuts of the adjacent rows?

A. When the sheet is completely cut and expanded, the line of cuts in each row beginning at the margin at one side of the sheet is parallel with the next and adjacent cuts, but such cuts do not represent the line of cuts made by the machine; the line of cuts made by the machine runs diagonally through the sheet.

X Q. 197. And the product of the alleged process of the patent in suit also has rows of simultaneously slit and opened cuts, and the cuts of each row alternate in position with the cuts of the adjacent rows. Is that not true?

A. The metal made by the process in suit has cuts made in one
line, the whole length of the sheet, and parallel in the edge of
171 the sheet. Such cut parts being pressed downward and
stretched to produce the opening of the metal to represent
one-half of a mesh, not a whole mesh, and it takes the succeeding and similar line of cuts, pressing downward and stretching of the cut portions, to produce the full opening. These cuts and all succeeding cuts are parallel to each other.

I answer this as fully as possible, because in your question you ask, are there not parallel rows of cuts and openings throughout the sheet.

X Q. 198. Will you now please answer the question?

A. I have stated that there exists in the metal as made by the patent in suit lines of parallel openings, alternating with each other.

X Q. 199. In your deposition given for the complainant in the suit in the Third Circuit, above referred to, did you not say as follows, concerning a machine and process of the Golding & Durkee patent No. 320,341.

"This process and machine I found had serious limitations, as the form of the cutters was necessarily such as to have fragile points both top and bottom, and were therefore liable to break off when used upon sheet steel of a greater thickness than a sixteenth of an inch, except the cutters were made as described in patent 320,241, patented June 16th, 1885, in which case the cutters overlapped each other, but by so doing their thickness determined the width of the strand to be cut, and a new set of cutters and readjustment of parts of the machine would be necessary to cut various widths of strands.

The cutters in patent 381,231, patented April 17th, 1885, were also limited to the cutting of one width of strand, except the angle of the cutters were changed. If their faces were turned so as to nearly represent one straight line the strands to be cut would be very narrow, whereas if they were set so as to represent a number of parallel lines these strands could be made of greater or less width, but this would require changing the holders of the cutters and also 172 the guilding device, which had always to direct the metal on the angle at which the faces of the cutters were set in the machine.

The limitations referred to in this machine caused me to seek for some other process for the manufacture of expanded metal."

Did you not also state:

"Q. 10. Will you now please describe the improvement in the process of making expanded sheet metal which is described in your patent 527,242, dated October 9th, 1894.

"A. I found by experimenting with a cold chisel, having its cutting end shaped similar to half of a diamond mesh, as shown on the last series of cuts in A Fig. 1, of patent 527,242, patented October 9th, 1894, that I could work thicker metal than by the process of the other patents described, and that the results produced a finished article of the same length as the original sheet due to the fact that the strands forming the meshes were elongated, and that the pressure imposed by cutters so formed had the effect of giving perfect alignment to the strands and produced altogether a more acceptable article. My first experiment with a cutter put into a power machine showed that the cutting of the second series of cuts somewhat distorted the lines of the metal which had already been cut, but it was evident that if all the cuts necessarily in the length of the sheet were made at a single stroke of the machine there would be no distortion of the metal already cut. This art is now being practiced with sheet steel and other soft homogeneous metals including thickness from No. 27 wire gauge to and inclusive of three-eighths of an inch in thickness."

And did you not also state with reference to the product of the alleged process of the patent in suit:

"As previously stated the finished sheet was practically the same length as the blank sheet from which it was cut. This is an inherent necessity for the reason that the machine makes one-half of 173 a mesh at each cut, and the strands forming such half-mesh are rigidly fixed to the metal which forms the intersections of the strands and which remain a part of the whole uncut sheet until the next half diamond, behind it, and breaking joint with it, is produced."

A. Yes.

X Q. 200. And in the deposition mentioned in the last question, did you not testify as follows, with reference to the Ohl patent:

"X Q. 71. The machine seen in the Ohl patent No. 475,700 simultaneously slits, bends and stretches portions of a plate or sheet of metal and then similarly slits and bends in places alternate with the first mentioned portions, is that not so, Mr. Golding?

A. It is so, and such slit and bent portions are always apart from each other, leaving undisturbed metal between them, both longitudinally and crosswise of the sheet."

A. That is a correct quotation.

X Q. 201. The product of the machine shown in the Ohl patent has been and is now being made and sold in the United States under the name of the Bostwick lathing, is it not?

A. I don't know that it is, and am in doubt about it, for the reason that I have searched both in Washington and Philadelphia for samples of the metal and have been unable to find any, and I have not for a long time seen any of it in use; but it has been manufactured and sold in years past.

X Q. 202. Don't you know of the Bostwick Steel Lath Co., now making this lathing at Niles, Ohio?

A. The only product I have seen within the past year bearing the name of Bostwick is the lathing which is cut and opened throughout in the same manner as my original expanded metal, and their advertisements all represent such metal as is called "Bostwick Ex-
174 panded Metal." I have recently perused certain trade papers
to find some advertisement illustrating the original Ohl or Bostwick lathing, but I have not found any.

X Q. 203. When you speak in your last answer of your original expanded metal, to what patent of yours do you refer?

A. I refer to that described in patent 297,382, April 22, 1884, and the Bostwick, a thing which I have seen, is made from a sheet which is first slit and then pulled open.

X Q. 204. The product of your said patent No. 297,382, which you say is being made by the Bostwick Co., is formed by slitting a sheet with parallel rows of slits, the slits of each row alternating in position with the slits of the adjacent row, and the rows being all formed parallel with the edge of the sheet metal blank; is that not so?

A. That is right.

X Q. 205. Your said patent No. 297,382, is the same patent that was held to be invalid by reason of anticipation, in the case of these complainants against the Board of Education, reported in 101 Fed. Rep. 395, and decided by the Circuit Court of Appeals for the Eighth Circuit. Is it not?

A. It is the patent involved in that suit.

X Q. 206. Are you familiar with the apparatus and mode of operation employed by the Northwestern Expanded Metal Co., of Chicago, in the manufacture of expanded metal?

A. I can testify as to their manufacture so far as concerned those made under my several patents.

X Q. 207. That Company is a licensee under that patent, is it not?

A. It is a licensee to use my patents.

X Q. 208. That Company is now making and selling expanded metal like that described in the Golding & Durkee patents No. 320,241, and No. 320,242, which I bel*ei*ve you designate as your second process, is it not?

175 A. I believe they have one machine making lathing of the kind about which you inquire.

X Q. 209. And the firm known as Chess Bros., in Pittsburg, is also making and selling the product described in said patents?

A. I believe they have two lathing machines similar to the one I refer to, and they also have one machine for making a four-inch mesh and which I understand is occasionally used when there is demand for such product.

X Q. 210. I show you an advertisement on the cover page of the "Construction News," a Chicago publication, dated April 28, 1906, which contains a cut of a piece of expanded metal in the following words:

KNO-BURN
Steel Plastering Lath
is the old reliable
First on the Market and Still Leads.
Fireproof—Strongest—Stiffest.

NORTHWESTERN EXPANDED
METAL COMPANY,

790 Old Colony Building, Chicago.

Is this an advertisement of the product of the said Golding & Durkee patent?

A. It is.

X Q. 211. And the same advertisement is still being inserted in the trade journals by the Northwestern Expanded Metal Co.?

A. I cannot answer that.

X Q. 212. How long has the Northwestern Co. been making for sale concrete reinforcing material in accordance with the patent in suit?

A. The machine built by Long & Alstat, sometime, I think in
1886—I meant to say 1896—made small mesh which was used
to some extent for reinforcing concrete arches, but they did
176 not have in their works a machine for making large mesh
expanded metal by the patent process at issue until about
two years ago.

X Q. 213. And the machine for making large mesh expanded metal by the alleged process of the patent in suit was not used commercially by the Northwestern Company until within the last twelve months, was it?

A. Oh, yes. I think for the past two years with one machine making material eight feet long, and they have recently put in another new machine of the same kind making metal twelve feet long.

X Q. 214. Give the dimensions of the mesh made by the Long and Alstat machine mentioned in your answer to X Q. 212?

A. As stated, it was a small mesh of nearly ¾ of an inch opening in the short way of the mesh.

X Q. 215. Give the length of the cut also?

A. I have not a sample with me, but I do not think it would be over an inch and a half in length.

X Q. 216. This material is much less than the size of the material which is commonly known as concrete reinforcement, and was only occasionally used for reinforcing for special purposes; is that not correct?

A. That is correct.

X Q. 217. And up to within two years, after the litigation on this patent against the Bradfords had started, all the ordinary reinforcing expanded metal made by the Northwestern Co. was made in accordance with the process and machine of the Golding & Durkee patent above referred to, which I believe you call your second process?

A. All that was made by them, but not all that was sold by them.

X Q. 218. And prior to the beginning of the litigation on this patent, in the suit against the Bradfords, which was recently terminated by the decision of the Circuit Court of Appeals for
177 the Third Circuit, all the ordinary reinforcing material made in the United States in accordance with the patent in suit was made by the firm of Chess Bros. in Pittsburg?

A. That is not correct. It was made by Chess Bros. in Pittsburg, and the General Fireproofing Co., of Youngstown, the defendant in this case.

And I believe it was also made by Youngstown Iron Steel & Roofing Co., of Youngstown, Ohio, neither of which last two parties are licensees under my patent.

X Q. 220. And it follows, does it not, from your last answer and from your previous testimony, that up to a time subsequent to the beginning of the litigation on the patent in suit against the Bradfords, all the ordinary concrete reinforcing material made by your licensees in the United States, in accordance with the patent in suit, was customarily annealed subsequent to its slitting and opening?

A. I am not aware that it was all annealed.

X Q. 221. You have already testified, have you not, in your opening deposition in this case, that all the concrete reinforcing material made in accordance with the patent in suit by Chess Bros. (The Central Expanded Metal Co.) was annealed, have you not?

A. I do not know that I said that all the metal made by Chess Bros. was annealed, but I believed it was their custom to anneal the metal, but to avoid confusion, I will say that none of the metal made under the process of the patent in suit by the Northwestern Expanded Metal Co. is annealed for the purpose of using it in concrete.

X Q. 222. And in view of your present answer, your answer to X Q. 220 should have been yes, should it not?

A. No, my answer should not have been yes, but no, for the reason that your question was not restricted to the metal made by Chess Bros., of Pittsburg, but to all the ordinary reinforcing concrete material made in the United States by licensees under the patent in issue which would include the Northwestern Co., who do not
178 anneal their metal for use in concrete.

X Q. 223. You have testified that up until the time subsequent to the beginning of the Bradford litigation the Northwestern

Co. did not make ordinary concrete reinforcing material in accordance with the patent in suit, and that all said material which was made in the United States by your licensees was made by Chess Bros., of Pittsburg; and you have also said that it was the custom of Chess Bros. to anneal its products for concrete reinforcing; how can you reconcile this with your last answer in which you attempt to say that prior to this litigation ordinary concrete reinforcing material made according to the patent in suit by your licensees was not customarily annealed. Can you make clear to the Court the contradiction in your answers?

A. You- question 221 is as to expanded metal made by our licensees in the United States within the whole time subsequent to the beginning of the suit. I understood your question to be relating to the whole time subsequent to the beginning of this suit.

X Q. 224. I will then ask you to state definitely whether it is not a fact that until a time which was after the date of the beginning of the litigation against the Bradfords, and also after the date of the beginning of this present suit, all the ordinary concrete reinforcing material made by your licensees in the United States in accordance with the patent in suit was customarily annealed after slitting and opening?

A. That is correct.

Recess.

Examination suspended.

X Q. 225. What company is it that manufactures expanded metal as your licensee on the Pacific Coast?

A. The Western Expanded Metal Co., at San Francisco.

179 X Q. 226. What is the tonnage of expanded metal produced by this Company?

A. I am in doubt as to whether they now produce any.

X Q. 227. As a result of the earthquake?

A. For the reason that for some years they have been purchasing their supplies from Chicago and Pittsburg.

X Q. 228. I understand from your answer that you do not have personal knowledge on this point? Is that correct?

A. That is correct.

X Q. 229. Will you produce a sample of the small mesh product of the Long & Alstat machine mentioned by you in answer to question 212?

A. There is none at present that I am aware of.

X Q. 230. Can you send for a sample and produce it for the Examiner?

A. I do not know whether I can obtain a piece of the metal as made upon this machine and used in concrete work, for the reason that such was made for special work and the machine is not run regularly upon such work; nearly the whole product of the machine is either for lathing or for use in cast iron brake shoes for railway cars to reinforce the cast iron. I only spoke of that material in concrete to make the statement complete.

X Q. 231. What were the differences between the machine of Long

& Alstat mentioned in your answer to question 186, and the machine which you devised and patented in your letters patent No. 581,713.

A. Generally speaking the machines differ in all their parts. In the Long & Alstat machine the blank sheet is automatically fed forward and shifted sideways on a table, whereas in my machine the metal is, by hand, pressed against stops in front of the cut-ers, and after the first cut the forward feed of the metal is accomplished by engaging the first strand just cut. The means of shifting the sheet in the machine devised by me is entirely independent 180 of the feeding device, and the cutters are differently supported in the machines.

Just as I say that the machines operated by Chess Bros. are different in respect of the cutters, the cutters in some machines being ground on their broad cutting faces, some on their narrow cutting faces, consequently some are set to move downward to compensate for the grinding and some are set to move inward toward each other to compensate for the grinding.

X Q. 232. Was it this Long & Alstat machine to which you referred in your answer to question 188, where you said:

"A machine made by the Northwestern Expanded Metal Co. was nearly finished before I made known to anyone in this country the mechanism which I employed in the machine (meaning the machine of patent No. 581,713)"?

A. Yes, that is the one.

X Q. 233. I understand from your answer to question 188 that this Long & Alstat machine was invented and built while you were in Europe and before you invented the machine of your patent No. 581,713?

A. Built while I was in Europe, but not finished before my return.

X Q. 234. And it was designed before you made the invention of this patent 581,713, which you so state in your answer to question 188, do you not?

A. I do not know the date upon which the mechanical engineer, named Mr. Carter, completed the design of this machine, but I do know that the machine was under way of being built by Long & Alstat when I returned home from England, and at which time, on my return, I was able fully to explain to those interested with me what I had invented and made.

X Q. 235. And when you returned from England was this 181 Long & Alstat machine completed to such extent that its design and intended mode of operation were apparent?

A. The machine was not delivered to the Northwestern Co., of Chicago, until some months after my return to this country. I did not see it in course of its construction, and until I did see it in operation, knew nothing about it, excepting what I was told and what I was shown in drawings by Mr. Carter.

X Q. 236. When did he show you those drawings?

A. Well, it may have been soon after my return, as the President of the Northwestern Co. was very anxious to know whether I thought the machine would be a good one.

X Q. 237. Does the patent No. 581,713 represent the machines which are used by the Northwestern Expanded Metal Co. or by Chess Bros., in the practice of the alleged process of the patent in suit?

A. The machines as operated by Chess Bros. in Pittsburg are substantially the same, in that the feeding is done in a similar manner. They connect up differently in some of their machines for the purpose of shifting the plate, and in some of their machines they shift the upper cutters instead of shifting the plate. The first machine built by the Northwestern for the purpose of cutting large meshes and heavy metal was built after drawings taken from the machine operated by the Expanded Metal Co. of Toronto, Canada, and which machine was built in England, and the result was similar to those employed in England and all other European countries.

X Q. 238. Was your trip to England, to which you refer, in answer to question 172, before or after the date of the filing of the application for the patent in suit?

A. My trip to England was made in the same week of the allowance of the patent in suit. I left on my trip to England the same week, or the week after, the allowance.

X Q. 239. Is it your belief that the patent in suit will cover as
an infringement the use of any machine, no matter how
182 constructed, in which expanded metal is made by the operation stated in the claim of your patent?

A. I should say that any machine built to follow the process described in patent 527,242 would be an infringement of that patent.

X Q. 240. No matter whether it had vertically reciprocating knives, as shown in patent No. 581,713, or rotary knives, as in the Bradford machine, would its use still, in your opinion, embody the process of the patent in suit?

A. I think so and the U. S. Circuit Court for this District so held.

End of cross-examination.

Redirect examination.

By Mr. Hunter:

R. D. Q. 238. You have stated that the Northwestern Expanded Metal Co., with the exception of the Long & Alstat machine, did not build any machines for practicing the new process of patent 527,242, until about two years ago; can you give any reasons for this delay?

A. Yes. I had repeatedly urged the introduction of the new machine into their works, but was told by the President of the Company that their financial condition did not warrant them in going to the great expense of putting in machines for heavy metal, and as I have before stated, there was not much profitable development of expanded metal business until after the period of the invention of the patent in suit. Besides this, the Northwestern Co. had some years previous had their works burnt out and they had to rebuild such machines as they had. They had also met with some severe trade losses, so that it was with considerable difficulty and subsequent reorganization that they kept the business afloat.

183 R. D. Q. 239. During this time and prior to the building of the machines for making the new process metal was the Northwestern Expanded Metal Co. selling new process metal of large mesh for concrete reinforcement?

A. They were selling a considerable quantity of such material, made by Chess Bros.

R. D. Q. 240. Referring now to the old process metal, or that described in your patent 320,242, how many steps or operation are required to produce a complete expanded diamond mesh?

A. One operation.

R. D. Q. 241. And in the new process of the patent in suit, how many steps are required to complete a single expanded diamond mesh?

A. Two operations. The first one being cutting, bending and stretching the metal until one-half of a diamond mesh is produced, and the second operation of making the other half of the diamond by cutting, bending and stretching the metal.

R. D. Q. 242. And in the Ohl patent 475,700, how many operations are required for making a complete line or row of loops?

A. One operation.

R. D. Q. 243. And in the Ohl patent what, if anything, does the cutting, bending and stretching of the second row of loops have to do with the previously performed operation of cutting, bending and stretching the first row of loops?

A. The cutting of the second row of loops has nothing whatever to do with the cutting of the first row of loops, as it is distant from such first row of loops, and if it were not distant from the first row of loops the entire sheet would be cut up into distinct and separate strips.

End of re-direct examination.

184 Recross examination.

By Mr. Bakewell:

R. X Q. 244. Is it not a fact that in the use of the machine of the Golding & Durkee patent, by which your so-called second process is practiced, after the knives have penetrated and opened out the strands, one part of each diamond is still an uncut portion of the sheet, so that the diamond is not completely cut away from the solid blank until the cut back of it is finished by the second stroke?

A. The full opening of the diamond is made by a single stroke of the machine, and remains so, but the next cut of the machine separate the metal forming this complete diamond further away from the sheet as it produces another whole diamond shaped mesh.

R. X Q. 245. And it does this by making a second series of cuts in alternate position to the first, the alternation of the cuts being effected by the oblique feeding of the blank. Is that not correct?

A. That is partly correct, but if you will refer to the specification and the drawing of the machine you will see that the short axis of the diamond does not stand in vertical position, but has taken a position oblique thereto, and does not remain in a vertical position, as is the case with the patent in suit. The oblique position of the axis of the first diamond made is due to the fact that the metal surrounding the diamond shaped opening has contracted endwise in one direction sufficiently to compensate for the opening of the metal.

End of re-cross examination.

JOHN F. GOLDING.

Adjourned to Thursday, September 20, 1906, at 11 A. M.

185 SEPTEMBER 19, 1906.

JAMES S. MERRITT, called as a witness, and having been duly sworn, testifies as follows:

By Mr. HUNTER:

Q. 1. Please state your name, residence and occupation?

A. James S. Merritt, 1917 Spruce St., Philadelphia, Mechanical Engineer and Manufacturer.

Q. 2. In a general way will you state your training and experience as a mechanical engineer?

A. I am a graduate of the Stevens Institute of Technology of Hoboken. After leaving there I was assistant engineer at the works of the Welsbach Light Co., and was for about a year with Bement, Miles & Co., of Philadelphia, and then engaged in the manufacture of building and miscellaneous iron work and am still in that business.

Q. 3. What is your present business; the name of your company or firm?

A. I am President and General Manager of Merritt & Co. a Pennsylvania corporation.

Q. 4. And what is the business of that company?

A. We manufacture builders', and miscellaneous iron work, such as fire escapes, stairways, roof trusses, window guards and lockers, and we also do considerable reinforced concrete construction work.

Q. 5. Have you had occasion, in your reinforced concrete work, to use what is known as expanded metal, and, if so, to what extent?

A. We have used expanded metal for the reinforcement of concrete since 1894, when it was first applied to that purpose. Since that time we have fireproofed hundreds of buildings using concrete reinforced with expanded metal.

Q. 6. I call your attention to two forms of expanded metal, one
marked Exhibit No. 16, and the others marked Exhibits No.
186 18 and 20. Have you in the course of your business had occasion to use both of these forms?

A. We have used in the course of our business large quantities of both of these forms of expanded metal.

Q. 7. Have you examined a copy of letters patent of the United States No. 527,242, dated Oct. 9, 1894, and, if so, do you understand the improvement in the method of making expanded sheet metal which is described and claimed therein?

A. Yes.

Q. 8. When did you first have occasion to examine that patent?

A. I cannot say positively, but it was probably soon after the patent was issued.

Q. 9. In your opinion, is the description of the method of making expanded metal described in this patent sufficient to enable any person skilled in the art to practice the same?

The question is objected to as leading and incompetent.

A. It is.

Q. 10. State whether or not, in your opinion, the description contained in this patent is sufficient to enable a skilled ma*h*chinist to construct a machine for applying the methods commercially to the production of expanded metal?

(Same objection.)

A. If by the term "skilled machinist" you mean a man employed at day wages to operate a lath or planer, I do not think that the description given in the patent would be sufficient to enable him to build a machine to produce expanded metal commercially, but I think the patent contains full and complete information which would enable a designer having ordinary or reasonable skill to design a machine which would accomplish the desired result.

187 Q. 11. Will you compare commercially the two kinds of expanded metal illustrated, one by Exhibit No. 16 and the other by Exhibits No. 18 and 20, and state what has been your experience with them?

A. As a reinforcement for concrete No. 16, the old form of expanded metal was of limited use as the gauge of steel from which it could be cut was comparatively light. I am sufficiently familiar with the machine upon which this form of expanded metal is cut, to be quite sure that it would be impossible to cut heavy gauge expanded metal in this way. On the other hand, the process by which Exhibits 18 and 20, the new style of expanded metal is cut, admit of the use of almost any thickness. The process of cutting the new style expanded metal, in which every strand is considerably elongated is a practical test of the quality of the steel, and this is in my opinion a valuable feature where expanded metal is to be used in the reinforcement of concrete. For certain purposes it is advisable to have the expanded metal as stiff as possible, and the elongation of the strand in the new form of the material produces the well known effect of wire drawing, or in other words renders the steel harder and stiffer than it was before the cutting and stretching took place. Although the old form of expanded metal was used to some extent in the manufacture of rough fencing, the sheets were never square, and as a result, this form of expanded metal when placed in a frame for use as window screens, elevator enclosures, and the like, never presented an attractive appearance. The failure of the sheets to come out of the old machine with the ends at right angles to the axis of the sheet was not due to any fault of manufacture, but was an inherent defect of the process due to the fact that the sheet passed through the machine in a diagonal direction, and that the spring in the sheet was sufficient to throw it out of square after the cutting had been done.

In the new material, the short diameter of the meshes is 188 exactly at right angles with their long diameter and the sheets can be used for many purposes where a framing is necessary, and where the old material would not have been commercially acceptable at all. The result of the invention covered by the patent 527,242, has in my opinion made expanded metal available in a multitude of cases, where the old mesh would not have answered at all, and has been of vital importance in bringing expanded metal into the general use which it enjoys to-day.

Q. 12. In recent years which of the two kinds of expanded metal have you used in your business to the greater extent?

A. We have used many times more of the new type than of the old.

Q. 13. Considering the work particularly of metal reinforcement for concrete, by means of expanded metal, which has been done by your company in recent years, state whether or not, in your opinion, the same work could have been done with expanded metal, if you had been restricted to the use of the old type or form?

The question is objected to as incompetent and immaterial.

A. Most of the reinforced concrete work done by us during recent years by the use of the new form of expanded metal could not have been satisfactorily done by the use of the old form of expanded metal only.

End of direct examination.

Cross-examination.

By Mr. Bakewell:

X Q. 14. What is your contract relation with the Expanded Metal Co., or Chess Bros.?

A. Under our contract with Chess Bros., we handle all ex- 189 panded metal matters for them in Eastern Pennsylvania, Southern New Jersey and the State of Delaware, buying from them such expanded metal as we may require in our work, but there is no financial connection between them and our company.

X Q. 15. You have the exclusive agency of the material of the patent in suit in the territory you have named?

A. Yes.

X Q. 16. And of course it is to your financial interest to have the patent in suit sustained, and to preserve the exclusive nature of this business, as much as possible?

A. It is.

X Q. 17. Have you a special arrangement with reference to the use of this material for lockers, which gives you the exclusive right throughout the United States?

A. We have not.

X Q. 18. Or the exclusive right for a territory larger than the one you have mentioned?

A. We have not with the exception of the State of Maryland, which I should have included in my answer to an earlier question.

X Q. 19. How often have you seen the machines like those on which Exhibits No. 16 and 18 respectively were made?

A. I have seen such machines at the works of Chess Bros., Pittsburg, and at the works of the Northwestern Expanded Metal Co., Chicago, upon numerous occasions since 1890; probably twenty or twenty-five times in all.

X Q. 20. Please state just what are the differences between the machines on which these two exhibits are made?

A. The two principal points of difference are the arrangement of the knives and the way in which the material passes through the machine. In the old form the face of the knives did not lie in the same plane and the sheet of steel was fed into the machine in
190 such a way that the first stroke made but one mesh at the corner of a sheet. The sheet then came through the machine in a somewhat diagonal direction. In the new machine the cutters were all in the same plane and the sheets passed through the machine in the direction of the short axis of the diamonds, the first stroke of the machine produced a row of half meshes along the entire side of the original steel plate.

X Q. 21. When the machine is constructed in the manner which you have described with reference to the new machine, namely, the cutters all in the same plane, and with guides arranged to pass the sheet through the machine in the direction of the short axis of the diamond, the result of submitting the sheet to the action of such machine is necessarily to produce a product like that of Exhibit No. 18, in which the strands are stretched, is it not?

A. I don't understand your question.

X Q. 22. I mean, if the metal sheet is passed through such machine, as you described, having the cutters all in the same plane, and guides arranged to keep the sheet in the direction of the short axis of the diamond, what kind of expanded metal is necessarily produced by the operation of such machine?

A. If the sheet is shifted longitudinally between each stroke of the upper blade, so that the points of those blades will begin their cutting operation midway between the points at which they began to cut during the first stroke of the machine, or if the upper set of shear blades is shifted both of which details are fully set forth in the patent 527,242, and if the sheet, of course, has been fed out beyond the lower cutter to the requisite distance, the product in my opinion, must be similar to Exhibit No. 18.

X Q. 23. In all varieties of so-called expanded metal, including Exhibits Nos. 16 and 18, the sheet is perforated with series of parallel slits, the slits of each row alternating in position with the slits of the adjacent row, is that not correct?

191 A. In my opinion this is true of all forms of expanded metal which have been procured by our Company from Chess Bros., Pittsburg, but there are one or more forms of so-called expanded metal about which I am not competent to express an opinion, as I have no knowledge as to the method of their manufacture.

X Q. 24. Is this fact true as to Exhibits 16 and 18?

A. I think it is.

X Q. 25. There are many other reinforcing materials used for concrete other than expanded metal, are there not?

A. There are.

X Q. 26. Wire fabric, resembling wire fencing, twisted rods, cables, etc., plain bars and deformed bars, are used for this purpose, are they not?

A. Yes.

X Q. 27. And in the aggregate these other materials constitute much more than half of the reinforcing material used for concrete, do they not?

A. I have never attempted to gather any statistics on this point, but I daresay you are right.

X Q. 28. And the reason why you prefer Exhibit 18 to Exhibit 16 as a concrete reinforcing material, is the greater weight or thickness of the material of Exhibit 18, is it not?

A. It is.

X Q. 29. You know by whom Exhibit 16 was made?

A. I do not.

X Q. 30. Where have you ever seen such material made as Exhibit 16?

A. I have seen it made at the works of Chess Bros., Rankin, near Pittsburg.

X Q. 31. It is made for use as a concrete reinforcement?

A. Yes.

X Q. 32. How recently have you seen such material made by Chess Bros.?

192 A. I think in January, 1905, but I can't be positive as to the date.

X Q. 33. You are using material like Exhibit 16 for lathing, at the present time, are you not?

A. Will you please define your definition of the word lathing?

X Q. 34. You may answer it in the sense in which you are accustomed to use the word lathing?

A. If you refer to the large mesh similar to Exhibit No. 16, we are using very little of it in the reinforcement of concrete, where the loads to be carried are light or where the spans are short. If you refer to a fine mesh material for the use of plasterers, we are using probably as much of this kind of expanded metal as we are of a fine mesh cut under the patent 527,242. The lathing for plasterers' use does not have to carry any great loads, but merely has to support the weight of the mortar and one kind of this lathing is about as good as the other for such purposes.

End of cross-examination.

Redirect examination.

By Mr. Hunter:

R. D. Q. 35. In your answer to X Q. 19, in which you were asked how often you have seen machines like those on which Exhibits

No. 16 and 18, respectively, were made, you say you have seen such machines on numerous occasions since 1890. Do you mean by this you have seen machines for making Exhibit No. 18, that is the new process of patent 527,242, as early as 1890?

A. No, I did not. The machine which I saw as long ago as 1890 was one for cutting material like Exhibit No. 16.

R. D. Q. 36. In answer to X Q. 28 you say the reason you prefer Exhibit 18 to Exhibit 16 as a concrete reinforcing material, 193 is the greater weight and thickness of the material of exhibit No. 18. Are these the only reasons why you prefer it?

A. This is the principal reason why I prefer it in the reinforcement of concrete, but it is commercially more uniform in section, and therefore in strength than the old style material. There are many purposes other than the reinforcement of concret-, such as the manufacture of clothes closets or lockers, for which the new style expanded metal is admirably adapted, but for which the old style material was not sufficiently good for the reasons which I have already explained in my answer to an earlier question.

End of re-direct examination.

JAMES S. MERRITT.

PHILADELPHIA, *Thursday, Sept.* 20, 1906.

Met pursuant to adjournment at 11 A. M.
Present: Counsel as before.
Recess until 2 P. M.

JOHN B. DOUGLAS, called as a witness, and having been duly sworn, testifies as follows in answer to questions.

By Mr. HUNTER:

Q. 1. Where do you reside?

A. Sharon Hill, Delaware County, Pa.

Q. 2. What is your occupation?

A. Machinist.

Q. 3. For how long have you been following this occupation?

A. Forty years, about.

Q. 4. Are you at present connected with any firm; if so, what?

194 A. I am superintendent of P. H. & A. S. Morris, Machinists and Engineers, 1501 So. Front St., Philadelphia.

Q. 5. In the course of your business are you in the habit of examining plans and specifications of machines for the purpose of superintending their construction?

A. Yes.

Q. 6. Have you examined a copy of letters patent of the United States No. 527,242, dated October 9, 1894?

A. Yes, I have.

Q. 7. When did you first see and examine a copy of that patent?

A. This is the first I have seen of it, a few minutes ago?

Q. 8. Supposing the said copy had been submitted to you in your capacity as superintendent of a machine shop, what have you to say as to the sufficiency of the description and illustration which it contains to enable you to understand the method of making expanded sheet metal which the said patent purports to disclose?

A. Well, I should say that the description there is enough to enable me to construct a machine to use that method.

Q. 9. Will you describe in your own words the method which you understand this patent describes?

A. Well, by making a series of slits in the metal and the machine would have to have a movable table, and each time the knives slit, each downward motion of the machine would slit the sheet, and the upward motion of the machine would move forward ready for the next stroke. At each downward motion of the cutter the metal is slitted and stretched, and that forms a row of half diamonds along the edge of the sheet, and the second operation the sheet shifts longitudinally and that makes a second row of half diamonds, which with the first row of half diamonds make the diamond. That operation would be repeated until the sheet is complete. The machine for making it is simple enough, but this is the whole thing, the principle. 195

Q. 10. With your experience in the construction of machines do you consider that there would be any difficulty experienced by a machine builder of reasonable intelligence to construct a machine for making expanded metal according to the method disclosed in this patent, from the description of the method which the patent contains?

A. I don't think it would be a hard proposition. I don't think it would involve any difficulty.

Q. 11. Do you consider that the creation of an organized machine is necessary to perform the process described in this patent, and to make a piece of expanded metal according to the method described therein?

A. I could do it by hand.

End of direct examination.

Cross-examination waived.

Signature waived.

Defendant's counsel objects to the testimony of this witness, and the testimony of complainant's witnesses, Golding and Merritt, regarding the sufficiency of the description of the patent in suit on the ground that their testimony is incompetent and argumentative, and also that it is not proper rebuttal, and gives notice that he will move the Court that the same be stricken from the record.

196 In the United States Circuit Court, Eastern Division of the Northern District of Ohio. In Equity.

THE EXPANDED METAL CO.
v.
THE GENERAL FIREPROOFING CO.

Examiner's Certificate.

STATE OF PENNSYLVANIA,
Philadelphia County, ss:

I, Rose M. Kelly, a Notary Public of the Commonwealth of Pennsylvania, residing in the County of Philadelphia, do hereby certify that the foregoing depositions of Rudolph M. Hunter, Lewis E. Curtis, John F. Golding, James S. Merritt and John B. Douglas, were taken before me as special examiner by agreement of counsel on behalf of the complainant in the suit in equity of the Expanded Metal Company, against the General Fireproofing Company, pending in the Circuit Court of the United States for the Eastern Division of the Northern District of Ohio, at the office of Ernest Howard Hunter, Esq., 926 Walnut Street, Philadelphia, on June 11th, 12th, 14th and 15, and September 18th, 19th and 20th.

In testimony hereof I have hereunto set my hand and official seal at Philadelphia, this ninth day of October, 1906.

[SEAL.]

ROSE M. KELLY,
Notary Public.

Commission expires 19th Jan., 1907.

197 STATE OF MISSOURI, *ss:*

I, Alexander A. Lesueur, Secretary of State of the State of Missouri, hereby certify that the annexed pages contain a full, true and complete copy of the Certificate of Incorporation of "The Expanded Metal Co.," issued August 12, 1884, as the same appears on file and of record in this office.

In testimony whereof, I hereunto set my hand and affix the Great Seal of the State of Missouri. Done at Office in the City of Jefferson, this first day of November, 1899.

[SEAL.]

A. A. LESUEUR,
Secretary of State.
By T. W. PARK,
Chief Clerk.

STATE OF MISSOURI:

No. 2599.

Certificate of Corporate Existence.

Whereas, John F. Golding, Joseph S. Salisbury, Oscar Bradford and Henry S. Turner, have filed in the office of the Secretary of State Articles of Association or Agreement in writing, as provided by law, and have, in all respects, complied with the requirements of law governing the formation of Private Corporations for Manufacturing and Business purposes.

Now, therefore, I, Michael K. McGrath, Secretary of State of the State of Missouri, in virtue and by authority of law, do hereby
198 certify that said parties, their associates and successors, have become a body corporate, and duly organized, under the name of

"The Expanded Metal Co.,"

and have all the rights and privileges granted to Manufacturing and Business Corporations under the laws of this State. And that the amount of the capital stock of said Corporation is One Hundred Thousand Dollars.

In testimony whereof, I have hereunto set my hand and affixed the Great Seal of the State of Missouri. Done at the City of Jefferson, this twelfth day of August, A. D. eighteen hundred and eighty-four.

[SEAL.] MICHAEL K. McGRATH,
Secretary of State.

Circuit Court of the United States, Northern District of Ohio, Eastern Division. In Equity.

THE EXPANDED METAL CO.
vs.
THE GENERAL FIREPROOFING COMPANY.

COMPLAINANT'S EXHIBIT No. 2.

Certificate of the Incorporation of The Expanded Metal Co.

HARRISON M. MUNDAY,
Notary Public.

199 2-175*b*.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the records of this office of an instrument of writing executed by

John F. Golding,
May 2, 1894, and

recorded in Liber F. 49, page 445.

Said record has been carefully compared with the original and is a correct transcript of the whole thereof.

In witness whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington this 2d day of October, in the year of our Lord one thousand eight hundred and ninety-nine and of the Independence of the United States of America the one hundred and twenty-fourth.

C. H. DUELL,
Commissioner of Patents.

200 Liber F 49,
P. 445.

Assignment of Invention.

In Consideration of One Dollar to me paid by The Expanded Metal Company, a corporation duly organized under and by virtue of the laws of the State of Missouri, I. John F. Golding, of Chicago, Illinois, do hereby Sell and Assign to the said The Expanded Metal Company a certain invention in Improvement in the Art of Expanding Sheet Metal as fully set forth and described in the application which I have prepared and executed this second day of May, A. D. 1894, preparatory to obtaining Letters Patent of the United States therefor.

And I do hereby authorize and request the Commissioner of Patents to issue said Letters Patent to the said The Expanded Metal Company, its successors, assigns or legal representatives, as the assignee of the entire interest therein for its and their sole use and behoof.

In testimony whereof, I have hereunto set my hand and seal this second day of May, A. D. 1894.

JOHN F. GOLDING. [SEAL.]

Recorded May 7, 1894.

Circuit Court of the United States, Northern District of Ohio, Eastern Division. In Equity.

THE EXPANDED METAL CO.
v.
THE GENERAL FIREPROOFING COMPANY.

COMPLAINANT'S EXHIBIT NO. 4.

Assignment of the Patent in Suit.

HARRISON M. MUNDAY,
Notary Public.

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201 In the Circuit Court of the United States, Northern District of Ohio, Eastern Division. In Equity.

THE EXPANDED METAL CO.
v.
THE GENERAL FIRE PROOFING CO.

COMPLAINANT'S EXHIBIT NO. 22,—.

Application file of patent in suit.

R. M. KELLY,
Notary Public.

2–389.

UNITED STATES OF AMERICA:

DEPARTMENT OF THE INTERIOR,
PATENT OFFICE.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the Records of this office of the File Wrapper and Contents in the matter of the Letters Patent of

John F. Golding, Assignor to
The Expanded Metal Company.
No. 527,242 Granted October 9, 1894,
for
Improvement in Method of Making Expanded Sheet Metal.

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the city of Wash-
202 ington this fourth day of January, in the year of our Lord one thousand nine hundred and seven, and of the Independ-

ence of the United States of America the one hundred and thirty-first.

[SEAL.] (Signed) E. B. MOORE,
Acting Commissioner of Patents.

Amount received
$15.
Chief Clerk.

MAY 4, '99.

Hon. Commissioner of Patents, Washington, D. C.

SIR: We herewith enclose the application of John F. Golding for patent in Art of Expanding Sheet Metal & check for $15.00 in payment of 1st Gov't. fee.

Very resp't'ly,
MUNDAY, EVARTS & ADCOCK.

Endorsed: U. S. Patent Office. May 7, 1894. Chief Clerk.

Petition.

To the Commissioner of Patents:

Your petitioner, John F. Golding, a citizen of the United States, residing at Chicago, in the County of Cook, and State of Illinois, prays that Letters Patent be granted to him for improvement in the Art of Expanding Sheet Metal set forth in the annexed specification, and he hereby appoints John W. Munday, Edward S. Evarts and Edmund Adcock, composing the firm of Munday, Evarts & Adcock, of No. 217 Adams Express Building, Chicago, Illinois, his attorneys,
with full power of substitution, revocation, to prosecute this
203 application, to make alterations and amendments therein,
to receive the patent, and to transact all business in the Patent Office connected therewith.

JOHN F. GOLDING.

Specification.

To all whom it may concern:

Be it known that I, John F. Gilding, a citizen of the United States, residing in Chicago, in the County of Cook and State of Illinois, have invented a new and useful improvement in the Art of Expanding Sheet Metal, of which the following is a specification:

In the manufacture of what is now generally known as expanded sheet metal, it has been customary to first cut the slits in the sheet metal at short distances apart, and to open the metal of the cuts thus formed by bending the severed portions of strands in a direction at right angles substantially to the plane of the sheet. It has also been made by simultaneously cutting and opening the metal by means of cutters set off or stepped relatively so as to make the slashes or cuts in different lines in the manner set forth in patents No. 381,230 or No. 381,231, or April 17, 1888. In both of these methods the product is somewhat shorter and materially wider than the original sheet, but practically no stretching or elongation of the metal forming the strands is caused.

In my present invention I seek to avai*d* myself of the ability of the metal to stretch or distend as well as of its ability to bend under strain or pressure, and the invention consists in the improved method of making expanded metal, viz., by simultaneously cutting and opening or expanding the metal at the cuts by stretching the severed portions.

In the practice of the invention I prefer to make a series of slits in a straight line across the edge of the sheet, at the time of
204 cutting the slits and as a continuation of that operation to
depress or stretch the severed metal, *i. e.,* those portions of the sheet lying outside of the cuts, in a direction at right angles to the sheet without any contraction from the length of the original sheet. This operation is then repeated after the sheet has been fed forward, the slits being made opposite the portions unsevered at the previous operation, and so on until the entire sheet is expanded.

My invention allows the use of a straight under knife, which of course does not need to be shifted in changing the location of the cuts, and the upper cutters are also arranged in a straight line, but their acting edges represent a corrugated form of alternate transverse projections and recesses adapted to co-act with the under knife in cutting the slits at the proper intervals and to stretch the severed strands. And either the upper cutter or the sheet is shifted back and forth between the operations as will be understood.

In the accompanying drawing Fig. 1 is a perspective of a sheet, a part of which has been expanded by my invention; Fig. 2 is an elevation of the preferred form of cutters used in manufacturing it; Fig. 3 is a section on line 3-3 of Fig. 2; Fig. 4 is a plan of the sheet showing the first line of slits in dotted lines.

In the drawing A represents the sheets from which the expanded metal is formed, B, represents the series of upper or moving cutters, and C is the lower knife which may be and preferably is stationary. The lower edges of the cutters B are so shaped as to form alternate transverse projections *b* and recesses or intervening openings *c*, the projecting "portions being adapted to co-act with the lower knife in forming the slits. They are also adapted to force or carry downward the severed portions of the metal at the same operation to the position indicated by the broken lines in *m* at Fig. 2. It will be noticed that at the time the bend is imparted to the severed portion there
can be no contraction in the product from the length of the
205 sheet A because the ends of the severed portion or strand are
still integral with the sheet and will not permit it. The sheet is then fed forward and the slitting and stretching operation is repeated. One line of slits across the sheet is formed at each operation, and the upper cutters, or the sheet, may be shifted and the sheet be fed forward between the operations so that the slits are in every case

made back of the portions left unsevered at the preceding operation, or in other words the slits and unsevered portions alternate in position at successive operations.

The bend given to the severed portion, or strands as they are usually called, is in a direction at right angles to the plane of the sheet, and as there is no contraction in the length of the metal, it necessarily follows that the expansion is obtained from the stretch, distention or elongation of the severed strands.

I claim:

I. The improvement in the art of manufacturing expanded metal, consisting in simultaneously slitting the sheet and stretching the severed portions.

JOHN F. GOLDING.

Witnesses:

S. E. CURTIS,
EDW. S. EVARTS.

Oath.

STATE OF ILLINOIS,
County of Cook, ss:

John F. Golding, the above named petitioner, a citizen of the United States, and resident of Chicago, in the County of Cook and State of Illinois, being duly sworn, deposes and says that he verily believes himself to be the original, first and sole inventor of 206 the improvement in the Art of Making Expanded sheet Metal, described and claimed in the foregoing specification; that the same has not been patented to him, or others with his knowledge or consent in any country; that the same has not to his knowledge been in public use or on sale in the United States for more than two years prior to this application, and he does not know and does not believe that the same was ever known or used prior to this invention thereof.

JOHN F. GOLDING.

Subscribed and sworn to before me this 2nd day of May A. D., 1894.

[NOTARIAL SEAL.]

LEWIS E. CURTIS,
Notary Public.

Endorsed: U. S. Patent Office, May 7th, 1894. Chief Clerk. Serial No. 510,343. Paper No. ½. Filed May 7th, 1894. J. F. Golding.

In the United States Patent Office.

No. 510,343.

In the matter of the application of John F. Golding, filed, May 7th, 1894. Art of Making Expanded Sheet Metal.

Hon. Commissioner of Patents.

SIR: I hereby amend the above application by inserting the following claim:

2. The herein described method of making open or reticulated metal work, which consists in simultaneously slitting and 207 stretching portions of a plate or sheet of metal away from the plane of the sheet, and then simultaneously slitting and stretching away from the plane of the sheet subsequent portions of the sheet in places alternate to the first mentioned portions, and by each successive slitting and stretching operation forcing the metal already operated upon further away from the original plane of the sheet, substantially as set forth.

Respectfully submitted,

JOHN F. GOLDING, *Applicant.*

New York, June 1st, 1894.

Endorsed: U. S. Patent Office, June 4th, 1894. Division XIII. Serial No. 510,343. Paper No. 1. Amendment A. Filed June 4th, 1894. J. F. Golding.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
JUNE 18TH, 1894.
Mailed June 18th 1894.

John F. Golding, care of Munday, Evarts and Adcock, 217 Adams Ex. Bldg., Chicago, Ill:

Art of Making Expanded Sheet Metal.

May 7th, 1894. 510,343.

251.

This case has been examined.

Claim 1, is found to be anticipated by patent to Ohl, No. 475,700, May 24th, 1892, (Builders' Hardware).

208 So far as at present advised claim 2 appears to be allowable. Claim 1 is rejected.

WM. H. BLODGETT, *Examiner.*

H. G. V. E.

Endorsed: Serial No. 510,343. Paper No. 2. Rejection dated June 18th, 1894. J. F. Golding.

Inventor, John F. Golding.
Invention, Art of making Expanded Sheet Metal.
Filed May 7th, 1894.
No. 510,343.
Room 251.

Hon Commissioner of Patents.

SIR: I hereby amend the above entitled application by canceling Claim 1.

Respectfully submitted,

JOHN F. GOLDING.

By Munday, Evarts & Adcock, Attorneys.

Washington, D. C. June 20th, 1894.

Endorsed: U. S. Patent Office. June 25th, 1894. Division XIII. Serial No. 510,343. Paper No. 3. Amendment. Filed June 25th, 1894. J. F. Golding.

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209 DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
JULY 2ND, 1894.
Mailed July 2nd, 1894.

John R. Golding, care of Munday, Evarts and Adcock, 217 Adams Ex. Bldg., Chicago, Ill.:

Art of Making Expanded Sheet Metal.

May 7th, 1894. 510,343.

251.

The above named case has been reconsidered, and it is thought that the claim does not clearly set forth applicant's invention, nor distinguish the present case from the patent granted applicant June 16th, 1885, No. 320,240. The claim is therefore rejected.

It is suggested that applicant adopt the claim enclosed herewith and substitute it for the present claim.

WM. H. BLODGETT, *Examiner.*

C. M. H.

Endorsed: Serial No. 510,343. Paper No. 4. Rejection. Dated July 2nd, 1894. J. F. Golding.

Claim suggested.

The herein described method of making open or reticulated metal work, which consists in simultaneously slitting and bending portions of a plate or sheet of metal in such manner as to stretch or elongate the bars connecting the slit portions and body of the sheet or
210 plate, and then similarly slitting and bending in places
alternate to the first mentioned portions thus producing the finished expanded sheet metal of the same length as that of the original sheet or plate, substantially as described.

CHICAGO, *July 5th,* 1894. Room 251.

Serial No. 510,343.
Filed May 7th, 1894.
Art of Making Expanded Sheet Metal.
John F. Golding.

Hon Commissioner of Patents.

SIR: In the matter of the above application we hereby amend by substituting the following for the claim:

"The herein described method of making open or reticulated metal "work, which consists in simultaneously slitting and bending por-"tions of a plate or sheet of metal in such manner as to stretch or "elongate the bars connecting the slit portions and body of the sheet "or plate, and then similarly slitting and bending in places alter-"nate to the first mentioned portions, thus producing the finished "expanded sheet metal of the same length as that of the original "sheet or plate, substantially as described."

Very respectfully submitted,

JOHN F. GOLDING.

By Munday, Evarts & Adcock, his Attorneys.

Endorsed: U. S. Patent Office. July 11th, 1894. Division XIII Serial No. 510,343. Paper No. 5. Amendment B. Filed July 11th, 1894. J. F. Golding.

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211 Issue Division.

All communications should be addressed to "The Commissioner of Patents, Washington, D. C."

Serial No. 510,343.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., *July 13th,* 1894.

John F. Golding, Ass'or, care Munday, Evarts & Adcock, 217 Adams Ex. Bldg., Chicago, Ill.

SIR: Your application for a patent for an improvement in method of making expanded sheet metal, filed May 7th, 1894, has been examined and allowed.

The final fee, twenty dollars, must be paid, and the letters Patent bear date as of a day not later than six months from the time of this present notice of allowance.

If the final fee is not paid within that period the patent will be withheld, and your relief will be by a renewal of the application, with additional fees, under the provisions of Section 4897, Revised Statutes. The office aims to deliver patents on the day of their date, and on which their term begins to run; but to do this properly applicants will be expected to pay their final fees at least twenty days prior to the conclusion of the six months allowed them by law. The printing, photolithographing and engrossing of the several patent parts, preparatory to final signing and sealing, will consume the intervening time, and such work will not be done until after payment of the necessary fees.

When you send the final fee, you will also send distinctly
212 and plainly written, the name of the invention and title of
invention as above given, date of allowance (which is the date
of this circular), date of filing, and if assigned, the name of the assignees.

If you desire to have the patent issue to assignees, an assignment containing a request to that effect, together with the fee for recording the same, must be filed in this office on or before the date of payment of final fee.

Additional copies of specifications and drawings will be charged for at the following rates: Single copies, un*d*ertified, 10 cents each.

The money should accompany the order.

Very respectfully, JOHN S. SEYMOUR,
Commissioner of Patents.

After allowance, and prior to payment of the final fee, applicants should carefully scrutinize the description to see that their statement and language are correct, as mistakes not incurred through the fault of the office, and not affording legal grounds for reissues, will not be corrected after the delivery of the letters patent to the patentee or his agent.

In remitting the final fee give the serial number at the head of this notice.

The within title is that given by the Examiner in charge, as most appropriate to your invention. Should you desire a change in the same, satisfactory reasons *must* be given therefor on or before the payment of the final fee.

Rec'd Room 31, $2.25.
Amount received, $20.
Chief Clerk. Tel.

213 Western Union Telegraph Company.

Number.	Sent by.	Rec'd by.	Check.
I.	CF.		$21 paid.

Received at 11 P. M.
Dated Chicago, Ill., 19th.

To Comm'rs of Patents:

We send telegraphic exchange for final fee application five ten three four three Golding, filed May 7 last, allowed July 13.

MUNDAY, EVARTS & ADCOCK.

Endorsed: U. S. Patent Office, Sept. 19, 1894. Chief Clerk.

Div. 13.

(Serial Number)
510,343. 1894. (Ex'r's Book)
43

610

Patent No. 527,242.
John F. Golding.
Ass'r to The Expanded Metal
Company.
(Corp. of Mo.)
Of Chicago.
County of
State of Illinois.
Invention Art of Making
Expanded Sheet
Metal.

214 Parts of application filed.
(Petition May 7, 1894.
(Affidavit " " "
(Specification " " "
(Drawing " " "
Model None
(Specimen None.
(First fee Cash $15, May 7, 1894.
(" " Cert.
Application filed complete May 7–90.
Examined. July 12, 1894. Blodgett, Ex'r.
Countersigned: J. W. Babson,
7-13-94. for Commissioner.
Notice of Allowance, July 13, 1894.
Final Fee Cash $20, Sept. 19, 1894.
" " Cert. 189–.
Patented, October 9, 1894.

MUNDAY, EVARTS & ADCOCK,
217 *Adams Ex. Bldg., Chicago, Ill.*

53 Metal Working XIII.
Miscellaneous. M.

215

1894.

Contents.

½. Application. 2 papers. O. K.
1. Amendment A—June 4, 1894.
2. Rejection—June 18, 1894.
3. Amendment—June 25, 1894.
4. Rejection—July 2, 1894.
5. Amendment B—July 11, 1894.
6. Passed—July 12, 1894.
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Title.

Improvement in Method of
Making Expanded
Sheet Metal.

171.
O. W.
F. B. E.

216

Robert W. Hunt & Co.
Bureau of
Inspection, Tests
and Consultation.

1121 The Rookery, Chicago.
66 Broadway, New York.
Monongahela Building, Pittsburgh, Pa.
Norfolk House, Cannon St., E. E. London, Eng.

REPORT OF PHYSICAL TESTS
of
Expanded Metal Strands

Submitted by Expanded Metal Co.

Chicago, June 12, 1906.

	1	2	3	4	5	6
Specimen Number,						
Marks,						
Specimen cut from,		Expanded Metal Stock				
Original Dimensions,	.169 x .126	.165 x .130		.171 x .131		
Dimensions after Fracture,	.163 x .098	.147 x .114		.152 x .082		
Original Area, sq. in.,	.02129	.02145		.0224		
Fractured Area, sq. in.,	.01597	.01676		.01246		
Elastic Limit, lbs., actual	1050	1185		638		
Maximum Load, lbs. actual,	1516	1484		902		
Elongation in 1 inches,				30		
Elastic Limit per sq. in.,	49320	55240		28480		
Tensile Strength per sq. in.	71200	69180		40270		
Per cent. Elong. in 1 inches,	Broke in jaw	Broke in jaw		30.		
Per cent. Reduction of area,	24.89	21.87		44.37		
Character of Fracture,	Irreg. Silky	Irreg Silky		Irreg Silky		
Cold Bend,						
Acc. or Rej.,						

ROBERT W. HUNT & CO.

U. S. Circuit Court
Northern Dist. of Ohio Eastern Div.

The Expanded Metal Co.
vs.
The General Fireproofing Co.

Complainant's Exhibit No. 23

Report of Hunt Tests
R. M. K.
N. P. & Sp. Ex'r.

217 Circuit Court of the United States, Northern District of Ohio, Eastern Division. In Equity.

On U. S. Patent No. 527,242.

THE EXPANDED METAL CO.
vs.
THE GENERAL FIREPROOFING COMPANY.

The answer of The General Fireproofing Company, defendant, to the bill of complaint of The Expanded Metal Co., complainant.

The defendant, The General Fireproofing Company, now and at all times hereafter saving and reserving all and all manner of benefits and advantages of exception that can or may be had to the many errors, uncertainties and insufficiencies in the complainant's said bill of complaint contained, for answer thereunto or unto so much or such parts as it is advised it is material for it to make answer unto, answering, says:

First. That the defendant has no knowledge or information sufficient to form a belief as to whether the complainant, The Expanded Metal Co., is a corporation created and existing under and by virtue of the Laws of the State of Missouri, and a citizen of said State and of the United States, as alleged in the said bill of complaint, and it therefore denies the same and leaves the complainant to make such proof thereof as it may be advised is material.

218 *Second*. The defendant admits that it, The General Fireproofing Company, is a resident of Youngstown, Ohio, in the Northern District of Ohio, Eastern Division, and has a regular place of business in said city in the said Northern District of Ohio, Eastern Division.

Third. The defendant admits that Letters Patent of the United States, No. 527,242, were on the 9th day of October, A. D. 1894, granted and issued to The Expanded Metal Co., as assignee of one John F. Golding for an alleged method of making expanded sheet metal, but whether or not due proceedings in all respects according to the requirements of the statutes in such case made and provided, were had, the defendant does not know and has no information save by said bill, and it leaves the complainant to make such proof thereof as it may be advised.

Fourth. And the defendant further answering upon information and belief, denies that on or prior to the 7th day of May, A. D. 1894, one John F. Golding, then of Chicago, Illinois, became and was the original and first inventor of certain new and useful improvements in method of making expanded sheet metal, made the subject of said Letters Patent of the United States, No. 527,242; and it denies that the said improvements were not known or used by others in this country, nor patented or described in any printed publication in this, or any foreign country, before the said alleged invention of the said John F. Golding; and it further denies that the said alleged inven-

tion or improvements in method of making expanded sheet metal was not in public use or one sale for more than two (2) years prior to his application for said patent and was not abandoned or proved
to have been abandoned; and it denies upon information and
219 belief that no application for foreign patents for the same in-
vention were filed more than twelve (12) months prior to the filing of the application for said improvements in this country; and it further denies upon information and belief that the said John F. Golding on the seventh day of May, A. D. 1894, made application in due form of law to the Commissioner of Patents of the United States for Letters Patent upon said invention and duly swore to the specification thereof; but to the contrary thereof, it alleges that the said Letters Patent were not duly applied for, nor were they lawfully issued or granted; and upon information and belief as aforesaid, it denies that the said John F. Golding was the true, original and first inventor of the said alleged improvements, which are described and claimed in or purported to be secured by the said Letters Patent; and it denies that the said improvements were at the time of the said alleged invention thereof by the said John F. Golding either new or useful, or that they were not known or used by others in the United States before his said pretended invention; and it further denies on information and belief that an instrument in writing or any instrument, purporting to be dated the second day of May, A. D. 1894, was duly executed and delivered and recorded in Liber F-49, page 445 of Transfers of Patents in the Patent Office of the United States, by virtue of which John F. Golding sold and assigned unto The Expanded Metal Co. the said improvements, and authorized the Commissioner of Patents to issue Letters Patent thereon to The Expanded Metal Co. as assignee of the entire interest therein.

Fifth. And the defendant further answering on information and belief, denies that the complainant herein and its alleged licensees, have heretofore exclusively exercised and enjoyed the rights and fran-
chises purported to be granted by said patent, and that ever
220 since the granting of the said patent, the said complainant
has been and still is entitled to the exclusive possession, exercise and control of the invention purported to be set forth therein; and the defendant further denies on information and belief, that the complainant and its alleged licensees have expended large sums of money in building machines for manufacturing expanded sheet metal, operating in accordance with the alleged method set forth and attempted to be claimed in Letters Patent No. 527,242; and the defendant denies that the complainant is able to supply the entire demand for machinery adapted to be used in the practice of said process, and it denies that such machines have gone into extensive use by the complainant's alleged licensees, who it is alleged have paid large sums of money therefor to the complainant.

Sixth. The defendant further answering on information and belief, denies that the alleged invention for which said patent was granted was and is very valuable and important and denies that the exclusive right to the possession and control of said patented invention as applied to and embodied in machines for manufacturing ex-

panded sheet metal has been and still is of great advantage and profit to the complainant herein, and it denies that but for the alleged wrongful acts of the defendant, or any acts of the defendant, the complainant would have derived and received still further and greater benefits from the exclusive rights and privileges alleged to be granted and secured by said patent. The defendant on information and belief further denies that said patent has been generally acknowledged as valid and acquiesced in in all parts of the United States or in any part thereof, and denies that the claims of the complainant to the exclusive rights to said invention under said patent have also been generally acknowledged and acquiesced in,
221 and the defendant further denies that since the complainant herein became the owner of said alleged invention, it and its licensees have expended large sums of money and been to great labor and exertion in and about the said invention and for the purpose of carrying on the business of manufacturing expanded sheet metal and making the same profitable to themselves and useful to the public.

Seventh. And the defendant further answering on information and belief, denies that at the time it is alleged to have commenced the alleged infringement thereof mentioned in the bill, it had full and actual notice of complainant's patent, and it denies on information and belief that it has ever had such notice.

Eighth. The defendant further answering, denies that well knowing the premises and the alleged rights purported to be secured to complainant, it continued to injure the complainant herein or deprive it of the benefits and advantages or any benefits and advantages which might or otherwise would accrue unto it from said invention; and the defendant denies that it did after the issue of said Letters Patent and before the commencement of this suit, without the license or allowance and against the will of the complainant, and in violation of its alleged rights and in infringement of the aforesaid Letters Patent, within the Eastern Division of the Northern District of Ohio or anywhere else in the United States unlawfully and wrongfully, and in defiance of any alleged rights of the complainant, make expanded sheet metal by the use of the alleged method purported to be set forth in the claim of said Letters Patent No. 527,242, and it denies that it is still continuing and is threatening to continue so to do; and the defendant further denies that it has acted in defiance of any alleged rights purported to be secured by or secured
222 to the complainant herein, in the matter set forth, and it denies that the complainant has had great and irreparable loss and injury or any loss and injury whatsoever.

Ninth. The defendant further answering, denies that it has made and sold a large amount of expanded sheet metal by the use of the alleged process or method of said patent No. 527,242, and denies that it has made and realized large profits and advantages therefrom; and the defendant further denies that it has used said alleged invention and that it is making preparation for and has avowed a determination to continue the same, and it denies that its alleged unlawful acts, or any of its acts, have been in disregard of any of the alleged rights of the complainant, and it denies that others have been encouraged to venture to infringe said patent in disregard of complainant's alleged rights.

Tenth. And the defendant avers on information and belief that the matter alleged to be covered by the said Letters Patent No. 527,242 is not an invention.

Eleventh. And the defendant avers on information and belief that the matter alleged to be covered by the said Letters Patent No. 527,242 was not novel and did not involve or require invention at the date when the said John F. Golding is alleged to have invented it, but was obvious from the prior art without patentable quality, and that the said Golding did not originate the same but obtained knowledge of it from the prior art.

Twelfth. And the defendant avers on information and belief that the matter alleged to be covered by the said Letters Patent had been in public use and on sale in this country for more than two (2) years before the application for said Letters Patent; and
223 it further alleges that the same was abandoned to the public.

Thirteenth. The defendant avers on information and belief that the invention claimed in the said Letters Patent as issued is substantially different from that indicated, suggested or described as the invention in the original application, and the patent is therefore null and void; and, further, that new matter was introduced into the application substantially altering the character of the invention claimed and without the oath of the applicant, and the patent is therefore null and void.

Fourteenth. And the defendant avers on information and belief that for the purpose of deceiving the public the description and specification of said Letters Patent filed in the Patent Office was made to cover less than the whole truth relevant to the alleged invention or was made to cover more than was necessary to produce the desired effect.

Fifteenth. The defendant avers on information and belief that the description of the alleged invention in the specification of said patent is not in such full, clear, concise and exact terms as to enable any person skilled in the art to which it pertains or with which it is most nearly connected to make, construct and use the same.

Sixteenth. And the defendant avers on information and belief that the claim of the patent is indistinct and the patentee has not therefore particularly pointed out and distinctly claimed the matter which he claims as his invention, but, to the contrary, has made a vague and nebulous claim that is calculated to mislead and deceive the public and that the patent is therefore null and void.

Seventeenth. And the defendant further avers on informa-
224 tion and belief that the alleged invention claimed in said Letters Patent is substantially identical with one or more inventions claimed in prior patents granted on the applications of the same inventor, John F. Golding.

Eighteenth. The defendant avers on information and belief that the complainant herein if it ever had any right of action against defendant, has lost the same by laches and delay in prosecuting its alleged rights.

Nineteenth. The defendant avers on information and belief that the matter alleged to be covered by said Letters Patent is not a patentable invention because the claim of the patent is for mere function, and, although drawn to cover an alleged process, as a matter of fact, involves nothing more than the functions and operations of a piece of mechanism or the abstract effect of a machine.

Twentieth. The defendant avers on information and belief that the matter covered by the said Letters Patent purports to relate to the statutory class of invention of a new and useful art, whereas, in reality, the invention, if any, resides in a different statutory class of invention—namely, an article of manufacture or a machine.

Twenty-first. And the defendant avers that long prior to any invention by the said John F. Golding of the alleged improvement described and claimed in the said Letters Patent the same and all the material and substantial parts thereof were fully described and shown in the following Letters Patent of the United States, to wit:

Letters Patent of the United States.

No. 23,597, granted April 12, 1859, to J. W. Mauterstock.
225 No. 297,382, granted April 22, 1884, to J. F. Golding.
No. 320,240, granted June 16, 1885, to J. F. Golding.
No. 320,242, granted June 16, 1885 to J. F. Golding and G. B. Durkee.
No. 400,774, granted April 2, 1889, to I. Kinney.
No. 408,599, granted August 6, 1889, to I. S. Elkins.
No. 447,085, granted February 24, 1891, to L. L. Sagendorph.
No. 475,700, granted May 24, 1892, to G. A. Ohl.
No. 214,038, granted April 8, 1879, to John V. Hennessey.
No. 381,230, granted April 17, 1888, to J. F. Golding.
No. 381,231, granted April 17, 1888, to J. F. Golding.

English Patents.

No. 2125, July 26, 1862, Thomas Long, and in divers other Letters Patent and printed publications to this defendant at present unknown but which, when discovered, it prays may be referred to and said reference added to and made a part of this, its answer.

Twenty-second. And the defendant avers that long before any invention by the said John F. Golding of the alleged improvement described and claimed in said Letters Patent, the same were known to and used by the following persons at the places set opposite their names, to-wit:

By J. W. Mauterstock, of New York, N. Y., at New York, N. Y., and elsewhere.

By J. F. Golding, of Chicago, Illinois, at Chicago, Illinois, and elsewhere.

By John F. Golding and G. B. Durkee, of Chicago, Illinois, at Chicago, Illinois, and elsewhere.

226 By G. B. Durkee, of Chicago, Illinois, at Chicago, Illinois, and elsewhere.

By Israel Kinney of Windsor, Ont., Canada, at Windsor, Ont., Canada, and elsewhere.

By Ira S. Elkins, of New York, N. Y., at New York, N. Y., and elsewhere.

By Longley L. Sagendorph, of Philadelphia, Pa., at Philadelphia, Pa., and elsewhere.

By George A. Ohl, of Newark, N. J., and elsewhere.

By John V. Hennessey, of Albany, N. Y., at Albany, N. Y., and elsewhere.

By Thomas Long, of Clarendon place, Notting Hill, in the County of Middlesex, England.

Twenty-third. The defendant further answering on information and belief, denies each and every other allegation in the said bill of complaint contained, except such as are herein expressly admitted to be true.

And the defendant prays the same benefit of the facts and things herein set forth, as if for the reason thereof it had demurred to the said bill, where a demurrer would have been proper, and the same benefit thereof as if it had specially pleaded to said bill where a plea would have been proper.

The defendant further answering, denies the equity of complainant's bill of complaint and says that the said complainant is not entitled to any injunction or to damages, nor to account of profits, nor to any other relief against the defendant, as prayed for in the said bill of complaint, and the defendant denies all the unlawful combinations and confederacy in the said bill charged, and the defendant further answering on information and belief, denies every allegation in said bill of complaint contained not hereinbefore admitted, answered or denied; all of which matters and things the defendant is ready to aver, maintain and prove as this Honorable Court may direct, and humbly prays to be hence dismissed with its reasonable costs and charges in this behalf most wrongfully sustained. 227

Dated July —, 1904.

THE GENERAL FIREPROOFING CO.,
[SEAL.] By WM. A. KINGSLEY, *Treas.,*
Defendant.

Attest:

WM. H. FOSTER, *Secretary.*

DICKERSON, BROWN, RAEGENER, & BINNEY,
Solicitors for Defendant.

HAROLD BINNEY,
Of Counsel for Defendant.

[Endorsed:] "Filed July 4, 1904."

228 United States Circuit Court, Northern District of Ohio,
Eastern Division.

THE EXPANDED METAL COMPANY
vs.
THE GENERAL FIREPROOFING COMPANY.

Respondent's Proofs.

Proofs for the respondent in the above-entitled cause taken before E. Van Zandt, Notary Public, as Special Examiner by consent, commencing Friday, April 14th, 1905, at the offices of Dickerson, Brown, Raegener & Binney, at 141 Broadway, in the City of New York.

Present: Harold Binney, Esq., for Respondent.

Pursuant to an understanding with opposing counsel adjournment was had to Monday, April 17th, 1905.

MONDAY, *April* 17, 1905—11 a. m.

Met pursuant to adjournment.
For Complainant, Ernest Howard Hunter, Esq.
For Respondent, Harold Binney, Esq.

Deposition of Oscar F. Gunz.

Q. 1. Please give your name, age, residence and occupation?

A. Oscar F. Gunz, age fifty; residence, Rutherford, New Jersey; occupation, expert in patent causes and solicitor of patents, with an office at 141 Broadway, in the City of New York. 229

Q. 2. Please state your qualifications to give opinions and evidence as an expert in matters of mechanics and in patent causes.

A. I am a graduate of the Technical University of Hanover, Germany, where I studied civil and mechanical engineering, mechanical and chemical technology and kindred branches from 1872 until 1877. Since 1879 I have been constantly engaged in preparing patent specifications, studying inventions, comparing inventions with the claims of patents, writing opinions and similar work, and for the last eighteen years I have been constantly engaged in testifying as mechanical expert in patent causes before the United States Courts and the Patent Office, and am at present so engaged in a very large number of causes.

Q. 3. Have you read and do you understand the Golding patent in suit, 527,242, and the earlier patents of Golding, 297,382, 320,240 and 320,242?

A. I have and I believe I understand the same.

Q. 4. Please state in a general way the relationships which these patents bear to one another, with any matters that may occur to you as indicating the correctness or incorrectness of any of the statements or assumptions expressed or implied in any of these patents?

A. The first Golding patent, 297,382, relates to an article of manufacture defined as slashed metallic screen. The specification states that in the manufacture of this metallic screen a blank piece of sheet metal of the required size and thickness is taken and is cut in such a manner that the cuts in each line of cuts are opposite the spaces between the cuts of the adjoining lines. It is also stated that the cuts are made of the required lengths to form the proper size meshes. This sheet having been cut is expanded length-
230 wise in a line transversely to the lengths of the cuts whereby
diamond shape meshes are formed, as illustrated in Fig. 2 of the patent. This act of expanding causes the metal forming the boundaries of each mesh to take an oblique position. The specification also states that between the ends of the cuts are spaces of metal which remain uncut and hold the strands of meshes together. The specification further states that the patentee does not restrict himself to precise details. I find that the patent states that a "blank piece of sheet metal" is taken and I understand that this may be any kind of sheet metal and that the kind of sheet metal is not necessarily confined to iron or steel but might be brass or copper, or in fact any other metal that could be expanded in the manner described without breaking the strands forming the meshes. I also understand that in this metallic screen the mesh is formed without actually stretching the metal, that is to say, the metal forming the strands itself is not elongated. I am well aware that the specification speaks of stretching and I have used the term "expanding" for the purpose of avoiding confusion between the two terms. However, there is unavoidably some stretching of the metal present because it is impossible to make the cuts in the sheet metal without stretching the metal itself to a certain extent. Such cuts must be shearing cuts and in such shearing cuts, the ends of which are bounded by solid metal, a certain amount of stretch of the metal a-ways takes place. The slashed metallic screen shown and described in this patent is the same as that described in British patent 2,125 of 1862 to Long. I understand that in view of this British patent Golding patent 297,382 was held by the United States courts to be invalid.

I next refer to the Golding patent 320,240 of June 16, 1885. This patent also states that a piece of metal is taken and that a series of rows of incisions are made throughout it so as to leave
231 uncut spaces between the ends of these incisions or cuts, and
furthermore the cuts are so arranged that the uncut spaces will be about midway of the adjacent cuts so that the cuts and the uncut spaces are made to alternate throughout the sheet. The metal as prepared is opened at the slits by causing the cut edges to be passed by each other all in the same direction and away from the original plane of the metal a sufficient distance to produce the desired size of the mesh, the ends of each strand being bent in opposite directions at or near the uncut spaces. It further says that the metal is expanded so that the strands and uncut spaces have their greatest movement in the direction of or near a right angle to the original plane of the metal and a less movement of the ends toward the center,

the strands and uncut spaces having a base in the aggregate equal in width but shorter than the piece from which they are cut.

There are two claims in this patent. Both relate to the art of making screening from slashed metallic plates or sheets and the first states that the improvement consists in "bending" the strands flatwise, line after line of strands successively and setting the strands so that they will be disposed edgewise to the thickness of the thinnest screening. The individual strands, as I understand it, are only bent and are not stretched, although here again as in the previous patent discussed it is obvious that the metal was "stretched" to some extent in making the cuts for the reasons heretofore given.

I next refer to the patent 320,242 of June 16, 1885, to J. F. Golding and G. B. Durkee. The patent states that its object is to provide a process for making the metallic screening described in the Golding patent 297,382 which I have previously discussed and which I understand was held to be invalid. The patent states that the process consists in the employment of a flat piece of metal and
232 then beginning at one side of one corner and making an incision within the side of the metal, thus forming a strand, "which is simultaneously pressed away from the plane of the metal" in a direction at or near a right angle. The next step in this process is to make additional incisions further within the plate of the metal and leaving uncut sections at the end of the cuts "and simultaneously with the cutting the strands are pressed away from the plane of the metal" at the angle and to the desired position as described above. The specification states that by the act of cutting and forming the meshes the finished article is contracted in a line with the cuts or incisions and consequently it is shorter in this direction than the original piece from which it is cut; but on the other hand is greatly lengthened in a line at an angle to the plane of the original sheet plate or blank.

In the method described and set forth in the Golding patent 320,240 the cuts there referred to were first made in the sheet and then by a subsequent operation entirely independent of making the cuts and after all the cuts had been made in the sheets the meshes were formed by "bending" the strands for the puropse of forming the meshes. In the present patent now under discussion 320,242 the sheet is not first cut throughout its entire surface, but the cuts are only made as the meshes are formed and, therefore, if the operation of making such a metal screen is interrupted at any time, we will find a metallic sheet, part of which has been converted into a slashed metallic screening, whereas the remaining part of the sheet is in the original condition in which it was placed in the machine. In the process of the earlier Golding patent 320,240 the sheet remains in its original condition until after all the cuts have been made; and after the cuts have been made the meshes are formed, but if the step of forming the meshes is interrupted at any time we will
233 have a sheet part of which is merely cut and the balance of which has been converted into meshes, but at no time can we have a sheet part of which is in its original condition and part of which has been converted into meshes as is the case in patent

320,242. Ignoring any further distinctions for the present it is evident that what is set forth in 320,242 is distinguished from what is set forth in patent 320,240 by the fact that in patent 320,240, the earlier Golding process patent, all the cuts are first made and then the strands forming the meshes are bent to form such meshes, whereas

In the Golding & Durkee patent 320,242 no cuts are made until the meshes are also formed at the same time. The specification distinctly states "making an incision within the side of the metal thus forming a strand which is simultaneously pressed away from the plane of the metal in a direction at or near a right angle." In the first Golding process patent 320,240 the cuts are first made and then there may be an intermission of time of greater or less duration between the forming of the cuts and the bending of the metal strands to form the meshes, but that interval of time whether it be long or short is and must always be present.

In the process of the Golding & Durkee patent there is no such interval of time, because the patent speaks of "simultaneously" pressing away, and when two actions take place simultaneously there can be no interval of time between the two actions.

The specification of the Golding & Durkee patent 320,242 states that the strands are formed and pressed away from the plane of the metal. It is absolutely impossible to cut this metal in the manner set forth and to press it away from the metal without causing some stretching of the metal forming the strands, and I understand from the testimony which I have read and given in this cause for complainants that such stretching or the existence of such stretch-
234 ing is not denied. I find on lines 51 to 58 inclusive of the
specifications of the Golding & Durkee patent 320,242 the following statement: "It is evident that the meshes could not be cut and simultaneously formed if the cuts were made in a single direct line across the metal for the reason that as the meshes are made the article which they form is contracted to a length less than the original length of the metal from which it is cut." From this I understand that it was the opinion of the patentees that it would be impossible to form the cuts in a single direct line across the metal because then the metal could not be bent and contracted to a less length than the original length and as the metal could not be contracted there would be no way of forming the mesh; or in other words if the mesh could not be formed by bending the metal no mesh at all could be formed. If the metal is cut in the manner described in the patent and which is clearly distinguished from cuts made in a single line directly across the metal such bending and consequent contracting to a less length than the original length of the metal is possible and thus a formation of the meshes by bending is possible. The patentees in the clause that I have quoted above therefore distinctly stated that it is impossible to cut the metal and simultaneously shape it to form the meshes on a single line direct across the metal. They do not actually there state that this is impossible because that would require a stretching of the strands lengthwise and that such stretching of the metal strands is impos-

sible; I mean to say that they do not state this in these exact words, but the clause quoted by me above does mean that in the opinion of the patentees it is impossible to do this.

I next refer to the Golding Patent 527,242 of October 9, 1894, which is the patent in suit and I understand that the John F. Golding the patentee of patent 527,242, is the same John F. 235 Golding who was joined with Mr. Durkee as patentee of patent 320,342. The patent in suit is for a method of making expanded sheet metal, that is, an article of the same kind as the other patents to which I have referred and which has been termed open metal work or metallic screening or metal-ic screening material or slashed metallic screening, and is generally known as expanded metal. In the specification of this patent in suit 527,242 the patentee states the following: "In the manufacture of what is now generally known as expanded sheet metal, it has been customary to first cut the slits in the sheet metal at short distances apart, and to open the metal at the cuts thus formed *by bending* the several portions or strands in a direction at right angles substantially to the plane of the sheet. It has also been made by *simultaneously* cutting and opening the metal by means of cutters set off or stepped relatively so as to make the slashes or cuts in different lines" (the italics are mine). The specification further states that in both of these methods the product is somewhat shorter and materially wider than the original sheet but that practically no stretching or elongation of the metal forming the strands is caused. The specification states that "practically" no stretching or elongation of the metal is caused but it does not say that there is absolutely no stretch. Practically no stretching or elongation does not include no stretching or elongation at all but admits that there is *some* stretching or elongation of the metal forming the strands. The specification then goes on to state that the ability of the metal to stretch or distend as well as its ability to bend under strain or pressure is now to be made use of and that the alleged invention consists in a method of making expanded metal by simultaneously cutting and opening or expanding the metal at the cuts by *stretching* the severed portions. 236 It should be noticed that the patentee Golding states that the alleged invention consists in simultaneously cutting and stretching the severed portions notwithstanding the fact that in the joint patent with Durkee it is distinctly stated that the metal cannot be simultaneously cut and stretched to form the meshes. The specification then goes on to describe how this cutting and stretching is formed and says that a series of slits are made in a straight line across the edge of the sheet and at the time of cutting the sheets and as a continuation of that operation the severed metal is depressed or stretched, that is to say, that those portions of the sheet lying outside of the cuts are depressed or stretched in a direction at right angles to the sheet *without any contraction from the length of the original sheet.* Then the sheet is fed forward, the operation is repeated, the slits now made being opposite to unsevered portions of the previous operation and so on. It will not be necessary to discuss the balance of the specification but I wish to call attention to the statement found on lines 98 to 100 of page 1 and lines 1 to 5 of page 2 which reads as follows:

"The bend given to severed portions, or strands, as they are usually called, is in a direction at right angles to the plane of the sheet, and as there is no contraction in the length of the metal, it necessarily follows that the expansion is obtained from the stretch, the distention or elongation of the severed strands."

Q. 5. Please state what differences if any there are save in degree as between the Golding process of the patent in suit and the prior process of Golding and others as employed for merely slitting the sheets with the series of slits?

A. As I have already explained, it is impossible to slit metal in the manner required for making expanded metal without
237 stretching the metal to some extent and that there is some
stretch in so slitting metal is stated in the patent in suit. I have also called attention to the fact that in so slitting metal such stretch takes place whether metal be slitted by rotary slitting devices or by reciprocating. Both rotary and reciprocating slitting machines were used prior to the patent in suit. As an example of a rotary slitting machine I refer to U. S. Patent No. 94,333 of August 31, 1869, to J. Wellington Nesmith, Improved Machine for Punching Metal Screens. As an example of a reciprocating machine for slitting metal I refer to the Patent 385,405 of July 3, 1888, to J. R. Branden, Machine for Slitting Metallic Sheets or Metallic Lathing. J are the upper knives and J^1 the lower knives and they are adapted to shear past each other and they shear from the middle to the ends and are convexed from end to end. Figs. 4 and 5 and 6 show the arrangement of the cutters or blades. Such a machine would slit the metal for any purpose and metal slitted on such a machine could be used for making the expanded metal according to the process of the first Golding process patent or could be used for any other purpose. In the process of the Golding patent in suit the metal is cut or slitted by a shearing cut and for the purpose of forcing the strands at the edge downward a greater distance so as to form a larger mesh the upper cutter or blade is so shaped that the height at the middle is comparatively large. A cutter of that type is found in the Brandon patent to which I have referred, and it will be seen that the only difference between the cutter of the Brandon patent and the cutter used as shown in the patent in suit is that the cutter of the patent in suit is carried down at the center of its end a greater
distance than is the Brandon cutter. This is all a matter of
238 degree and by making the cutter comparatively flat at the
cutting end and only sufficient to slit the metal a very slight stretching or elongation is produced. If the center of the end of the cutter is made more V-shaped there will be more stretch of the metal, and if the center of the cutter is made still more V-shaped there will be still more stretch. As these various forms of cutters are mere matters of degree so likewise is the forming of the greater stretch or the greater elongation by stretching merely a matter of degree.

Q. 6. Is it the shape of the cutting member, as to its being more or less V-shaped, that determines the amount of stretch put into the metal as it is sheared or cut?

A. That is my understanding. The deeper the V-shape part is the further down will it draw the center of the part that is sheared off, and thus increase the length of this part, and this length can only be obtained by stretching or elongating the metal. Of course I am always supposing that the slits themselves made by the cutter are all of the same length.

Q. 7. When Mr. Golding in the Golding and Durkee patent, 320,242, made the statement or assertion that "it is evident that the meshes could not be cut and simultaneously formed if the cuts were made in a single direct line across the metal," was that correct in fact or was it contrary to the general knowledge in the metal working art?

A. It was entirely contrary to the general knowledge in the metal working art. Before that time numerous patents had been issued which showed that metal could be cut and simultaneously stretched to fully as great a degree as is necessary for the purpose of forming the meshes of expanded metal and patents have been issued which so sheared and simultaneously stretched the metal in a continuous line or row across the sheet as distinguished from making a
239 single projection by shearing the metal and at the same time stretching it to form this projection or loop.

Q. 8. Will you please refer to some of the patents in the art of cutting and forming sheet metal which show prior to the application for patent in suit that it was well known that the metal could stretch sufficiently to form the half mesh that is formed in the process in suit and that it was customary in the art to recognize the ability of metal to be simultaneously cut and then stretched without disturbing the adjacent portions of the sheet, and in the desired degree?

A. I first referred to U. S. patent 235,417 of March 1, 1881, to L. Willer, Machine for Splicing or Connecting Bale Ties. This machine is constructed with swaging dies which force the lips formed by cutters together and cut the metal of the bands and force parts upward at the proper time. Fig. 6 of the drawings shows the band of metal and shows parts cut and forced out of the plane of the metal and such forcing could not be accomplished without stretching the metal.

U. S. patent 408,599 to I. S. Elkins, Metal Lathing of August 6, 1889, shows a metal lath in which there are rows of loops B which are formed by slitting the metal and forcing the metal detached by slitting upward from the plane of the metal the ends of this raised portion remaining connected with the sheet. The metal could only be shaped in this manner by stretching or elongating the metal forming the loop B and by no other way. Fig. 4 of this Elkins patent shown these loops extending at right angles to each other thus clearly illustrating beyond question of a doubt that these loops were formed by stretching the metal and also showing to how great an extent a sheet of metal can be cut and stretched for the purpose of forming such loops.

240 Patent 447,085 of February 24, 1891, to L. L. Sagendorph, Metal-ic Lathing. This patent shows a sheet of corrugated

material and in the corrugations loops are formed extending in the direction of the corrugations, that is to say the length of the corrugations and the length of the loops extend in the same direction. Such loops A could only be formed by slitting the metal and then stretching or elongating it. This patent shows that even after the metal has been strained more or less by corrugating it it can still be slitted and the metal bounded by the slits can be forced up or down and at the same time elongated or stretched to form these loops.

Patent 432,141 of July 15, 1890, to C. Kinney, Metal-ic Lathing. This patent shows a sheet of metal provided with projections which are formed by making a slit in the metal and forcing the edges or lips of the slot made out from the face of the metal and such lips or edges projecting from the face of the metal to the extent shown in this patent could not be made without stretching the metal itself.

Patent 459,625 of September 15, 1891, to W. W. Bostwick, Metal Lathing. This shows a sheet of metal having parts forced out beyond the plane of the metal and severed from the metal along its sides and such a loop could only be formed by actually stretching the metal forming the loop.

Patent 309,375 of December 16, 1884, to F. Bommarius, Bale Band Splicing Machine. This patent in Fig. 7 shows a diagram illustrating the action of the punches upon the band. These dies simultaneously cut and bend and cause to engage one with another the loops. The work there performed could only be done by stretching the metal.

U. S. Patent 460,850 of October 6, 1891, to C. H. Curtis, Metal Lathing, shows a metal lathing made of metal having incisions and
the plate intended to form hoods. It is clear from an inspec-
241 tion of the drawings that for the purpose of forming such
hoods it is absolutely necessary that the metal be stretched as
it could be formed in no other way, and the machine illustrated in Fig. 4 shows clearly that the metal is stretched and slitted simultaneously.

Patent 475,700 of May 24, 1892, to G. A. Ohl, Machine for Making Metal Lathing illustrates in Figs .10 and 11 such metal lath. The patent says, speaking of these strips S, "These strips are formed by sustaining the sheet over suitable recesses and shearing the edges of the strip from the sheet, at the same time stretching the sheet longitudinally and bending it in a curve below the aperture." This patent also clearly shows and describes simultaneous slitting and stretching of the metal for the purpose of forming a projection or loop precisely like the half mesh formed by each operation of the cutters in the machine illustrated in the patent in suit.

Patent 489,850 of January 10, 1893, to M. H. Crittenden and F. V. Emery, Metallic Lathing. This patent also shows metal which is slitted and forced outward, thereby being stretched to form pockets or hoods projecting beyond the plane of the metal.

U. S. Patent 519,952 of May 15, 1894, to G. Hayes, Metallic Lathing. This patent shows a corrugated sheet and in the corrugations slits are made and the metal is then corrugated and by the corrugations the slits are opened to have different widths at different portions of their length, and this also necessitates a stretching of the metal.

Paatent 459,726 of September 15, 1891, to H. A. Stone, Machine for Producing Metal Lathing, and patent 459,727 of September 15, 1891, to H. A. Stone, Machine for Producing Metal Lathing, both show machines provided with two sets of rolls for making 242 metal lath by slitting the metal and forming a series of loops projecting from the plane of the sheet.

Q. 9. I notice that in the patent in suit, particularly Figs. 2 and 3, which show the shape of the cutters and the shape of the strand as depressed or formed by the cutters, the divergence of the metal from its original straight line is shown considerably less than in the Ohl patent and some of the other patents to which you have referred and that the shape of the cutters in the Ohl patent and in the Stone patents appear to depart much further from the straight line than those of the patent in suit. Please state what would be the necessary degree of stretch of the metal as compared with the stretch of the metal of the patent in suit. Is it greater or less?

A. It is greater than in the patent in suit.

Q. 10. In prosecuting the application for the patent in suit did Mr. Golding do anything to expressly show that he recognized the misstatement contained in his earlier patent as to its being evident that the meshes could not be cut and simultaneously formed in a single direct line across the metal, and did he also as a precedent to the grant of the patent in suit disclaim any novelty or discovery in his process so far as the feature set forth in the statement of invention lines 26 to 33 of the patent in suit, to wit, "and the invention consists in the improved method of making expanded metal, namely, by simultaneously cutting and opening or expanding the metal at the cuts by stretching the severed portions?"

By consent the witness in answering may refer to the digest of the patent application for the patent in suit, in lieu of a certified copy.

243 A. I find from an examination of this digest that the application was originally filed with the following claim:

"The improvement in the art of manufacturing expanded metal, consisting in simultaneously slitting the sheet and stretching the severed portions." By a letter dated June 18, 1894, the Patent Office rejected this claim on patent to Ohl 475,700 of May 24, 1892, to which patent I have previously referred; then by an amendment filed June 25, 1894, the claim which I have quoted above was cancelled by Golding. By so doing, that is, by cancelling the above quoted claim in view of the patent to Ohl, Mr. Golding clearly showed that he did recognize the misstatement contained in his prior patent, and likewise by cancelling this claim he disclaimed the improvement in the art of manufacturing expanded metal consisting in simultaneously slitting or cutting the sheet and expanding or stretching the severed portions as set forth in lines 29 to 33 of his specification and forming part of the statement of invention.

The answer is objected to so far as it attempts to specify the legal consequences of the amendment of the Golding application which resulted in the allowance of the patent in suit.

Q. 11. The patent in suit also says, page 1, line 82: "It will be noticed that at the time the bend is imparted to the severed portions, there can be no contraction in the product from the length of the sheet A because the ends of the severed portion or strand are still integral with the sheet and will not permit it." Is this more or less true in the operation of the Ohl patent or any of the other patents wherein the ends of the bent portions remain attached to the undisturbed portions of the sheet?

A. It is true of all these earlier patents, as there is no possi-
244 bility of contraction in the product from the length of the
sheet.

Q. 12. In applying any of the various well-known ways of cutting and forming metal, what is it that determines the location where the cuts are to be made in producing a given shape of article?

A. The distance which the sheet is moved forward in relation to the mechanisms that produce the cuts.

Q. 13. Independently of the Ohl patent and other patents in their relation to the patent in suit, and assuming that the earlier patent of Golding & Durkee, 320,242, had omitted the word "not" in the misstatement referred to, so that the assertion had read "it is evident that the meshes could be cut and simultaneously formed if the cuts were made in a single direct line across the metal," would or would not this in itself have substantially disclosed the process of the patent in suit?

The question is objected to as misleading, first, because the statement that the paragraph referred to is a misstatement is not supported by facts; and second, because the paragraph when amended to omit the word "not" would be a manifest misstatement of facts, as it should be manifest to any person skilled in this art that meshes could not be cut and simultaneously formed if the cuts were made in a single direct line across the metal, nor are meshes formed in this manner in any patent or publication that has been referred to at any time in this art. Such a method as this could not result in the production of expanded metal.

Respondent's counsel refers to Fig. 4 of the patent in suit and the accompanying description as one instance completely answering the assertions of complainant's counsel, the five cuts in Fig. 4 being
"made in a single direct line across the metal."

245 Complainant's counsel suggests that it is evident from the
foregoing statement of counsel, as well as from the deposition
of the witness, that the process of the Golding & Durkee 1885 process
patent 320,242 as well as the process described in the patent in suit
have been misunderstood.

Respondent's counsel remarks that the objection seems to be based on the assumption that a "single direct line" does not mean what it says, but rather that it has reference to a series of parallel cuts such as are actually formed in the patent 320,242 along a diagonal area.

He prefers, however, to take the depositions of the witnesses rather than now spend time in argument.

Complainant's objection is based on the assumption that a single direct line of cuts means that and not something else, and it is because of the fact that as the question is worded it gives to these words a different meaning that he has objected to it. He merely makes the objection in order that the Court may be advised that complainant does not accept the interpretation which this witness and defendant's counsel appear to be attempting to place upon the statement in lines 51 *et seq.* of Golding & Durkee 1885 process patent and their application to patents of the character of the Ohl patent 475,700 and to the complainant's patent in suit.

A. If the word "not" would be omitted from the statement on lines 51 to 54 of the Golding & Durkee patent 320,242, this certainly would in itself substantially disclose the process of the patent in suit for in the patent in suit the cuts are certainly made in a single line and it is a straight line and it is a direct line and extends across
the metal, for if it did not extend across the metal you could
246 not make any cuts in the metal.

Q. 14. Assuming for the moment that complainant's counsel was right in the assumption that this sentence did not mean "single direct line" as distinct from single series of parallel cuts, is the statement in the Golding patent 320,242 any less erroneous? And does not the first row of simultaneous parallel cuts as set forth in the Ohl patent demonstrate this?

Question objected to as complainant's counsel has never made any such assumption as that suggested in the question.

A. If this sentence is read to mean a series of parallel cuts so that the statement would read "It is evident that the meshes could not be cut and simultaneously formed if the cuts were made as a single series of parallel cuts across the metal" the statement would still be erroneous and the first row of simultaneous cuts in the Ohl patent demonstrates this.

Adjourned to Tuesday, April 18, 1905, 11 A. M.

NEW YORK, TUESDAY, *April* 18, 1905—11 a. m.

Met pursuant to adjournment.

Direct examination of Mr. GUNZ continued.

Q. 15. Excepting as to the location of successive cuts as determined by their location in the article to be produced, please state what substantial differences there are if any as between the treatment, process, or "art" of the Ohl patent and of the Golding patent in suit?

A. There are no differences whatever except as to the loca-
247 tion of the cuts or slits or the stretched portions, because in
Ohl the metal is simultaneously slitted and bent in such a manner as to stretch or elongate the metal that has been severed lengthwise from the plates and in this Ohl patent the metal is then similarly slitted and bent in places alternate to the first mentioned

portion. The method is precisely the same with the exception of the location of the cuts, or, in other words, the amount of the feed of the metal is different in Ohl from the process of the patent in suit.

Q. 16. Assuming that it be held that the alleged method of the patent must stand or fall as a method defining treatment and not as distinguished solely by the shape or design of the article, please give your opinion on this assumption as to whether the claim *verbatim et literatim* of the Golding patent applies to the Ohl patent process.

A. It does in every respect as Ohl simultaneously slits, bends and stretches portions of a sheet of metal and then similarly slits, bends and stretches in places alternate to the first.

Q. 17. And does Ohl produce the finished article of the same length as the original sheet or plate?

A. He does produce the finished article of the same length as the original sheet or plate.

Q. 18. The claim in suit starts with the words "The herein-described method of making open or reticulated metal work." Are the various patents to which you have referred, including Ohl, Bostwick, Crittenden, Curtin, Elkins, Hayes, Israel Kinney, Cyrus Kinney, Nesmith, Sagendorph, and Stone, in the same art of making open or reticulated metal work?

A. They are.

Q. Assuming that the order of succession, in which different parts of a plate are treated in simultaneously slitting, bending and stretching it, constitutes a process or method, whether patentable or
248 not, would there not necessarily be as many such methods as
there were different known shapes or designs of articles to be made?

Question objected to as indefinite, and therefore misleading in that it does not appear clearly what is meant by "different known shapes or designs or articles to be made."

A. There naturally would be, because under this supposition every change of the feed of metal would be a new process and naturally the metal would have to be fed at different speeds or at different intervals or for different dimensions, according to each different pattern, shape or style of the completed article to be made.

Q. 20. And a given article, such, for instance, as the lathing shown in the Ohl and Bostwick patents might be made in perhaps half a dozen different methods or orders of procedure, might it not?

A. Yes.

Q. 21. Take for example such lath as is shown in the Bostwick, Ohl and Elkins patents; would it or would it not be possible to proceed in any of the following methods:

(*a*) Simultaneously slitting all the slits and thereafter bending and forming simultaneously all the strands or arches or meshes.

(*b*) First slitting one double row of slits in a straight line across the metal, then feeding the metal and similarly slitting in places alternate of the first row and so on successively, and subsequently bending, stretching and forming all the strands or meshes.

(*c*) First slitting the strands or meshes in a single series side by side as by a roller cutter, then similarly slitting the next series by the

further progress of such cutters and so on until the slitting is
249 finished and then bending, stretching and forming all the
strands or meshes simultaneously.

(*d*) "Simultaneously slitting and bending portions of a sheet of metal in such manner as to stretch or elongate" the strands in a single row and then proceeding to simultaneously slit, bend and stretch in places alternate to the first and so on throughout the sheet.

And are there not very many other readily conceivable and definable methods or orders of procedure, all of which would produce precisely the same lathing?

Objected to as irrelevant and immaterial, none of the methods mentioned in the question being the method of the patent in suit or capable of producing the results of that method.

Defendant's counsel in reply to the objection to the relevance states that this particular line of testimony is offered as showing the marked distinction between mere orders of procedure in manipulation or mechanical treatment of sheet material involving no new application of the forces of nature on the one hand and such processes as involve the application of chemical, electrical, metal-urgy, metallurgical or other application of the forces of nature in the ways that the patent laws provide for as "arts" in accordance with the leading case of Risdon Iron & Locomotive Works *vs.* Medart and cases following. The objection to relevance is therefore not clear to examining counsel.

The objection is repeated, because however interesting the legal discussion for which this question is intended to lay the foundation, it refers only to the production of material of the character shown in
the Bostwick, Ohl and Elkins patents and has no relevancy
250 to the totally different process of the patent in suit. The objection is also repeated in view of counsel's statement because of the fact that the United States Circuit Court for the Eastern District of Pennsylvania has already decided that the case of Medart against the Risdon Iron Works has no bearing upon this patent.

Defendant's counsel waives the supposed necessity of repeating objections to a question that has not been repeated and takes exceptions to the statement as to alleged matters of record in the Eastern District of Pennsylvania, as counsel believes the statement is inaccurate to say the least inasmuch as his Honor Judge Holland saw fit to consider such time-honored decisions as Cochrane *vs.* Deener and Tilghman *vs.* Proctor which were cases on chemical processes involving fats and the purification of middlings, etc., and did not so far as counsel can remember refer to the mechanical process case of Risdon *vs.* Medart.

It is suggested that counsel having now somewhat abundantly stated his objections and defendant's counsel having as was proper, explained the relevancy of the question, the witness be allowed a chance.

Complainant's counsel has no desire to argue the case on the record and thinks such practice improper, and does not see that the objection which he made to the question rendered such an argument necessary.

A. I answer "yes" to all these propositions.

Q. 22. Touching the objection or argument of complainant's counsel following the last question, and the reasons he gave, please state whether or not it is the fact that by the arbitrary shear-
251 ing and stretching of sheet metal in making open or reticulated metal work in various places and at various angles, it is not necessarily the fact that very different types and designs of finished articles would be produced, even though the process were identical in its individual steps, though different in the order of succession and location of the various cuts?

Objected to as indefinite as it is not clear what is meant by "types and designs."

A. That is certainly the case, because without in the least varying the process or method, but by changing the place or places of acting on the metal, different pattern, shapes or types must necessarily be produced because using the same method or process on one sheet at certain places of the sheet and using the same method or process on a like sheet in the same manner but in different locations in relation to each other must necessarily produce an article of different appearance, design, character, and even adapted for different uses without in the least requiring any change in the process or method.

Q. 23. Can you give any definite example of this truth, as for instance, the production of two very different types of articles, as different, say, as the Bostwick lath and the various forms of Long's, Johnson's or Golding's lath by the use of exactly the same cutters in exactly the same machine tools?

A. I can. I made use of an ordinary Bliss Manufacturing Company punching machine, which was operated by rotating a shaft carrying a fly-wheel, whereby the punch-holder was reciprocated. In this punch holder a cut was secured having a number of projections such as shown at B in Fig. 2 of the patent in suit, or substantially the same shape, and beneath the same a straight edge cutter, which was permanently secured in such a manner that
252 when the die or punch holder was reciprocated the cutter moved downward along the side of the fixed blade and upward. I placed a piece of sheet metal into this hand machine and turned the fly-wheel, causing the cutter to descend and to slit and bend and stretch the sheet metal, thereby forming one row, in line end to end, of loops or arches, such as are shown in the Bostwick or Elkins lath. I then shifted by hand this piece of sheet metal so as to produce another row of such loops or arches, separated from the first row a distance about equal to the width of such an arch or loop, and again caused the cutter to descend and form a second row of such loops or arches, the loops or arches of the second row being offset from the first row, that is to say, the centers of the loops or arches of the second row were opposite the spaces between the arches or loops of the first row, that is, as near as I could get them without gauges or measuring device. I thus made a piece of sheet metal having the loop or arches of the Bostwick or Elkins metal lath.

I then used this same sheet and fed the edge part over the fixed knife a distance less than the transverse distance of the upper or movable knife or cutter and caused the cutter to descend and thereby cut out, bend and stretched a number of loops or arches precisely like those previously made, only not so wide. These loops or arches were also in line, end to end, and were located or formed on the edge part of the metal. I then shifted the metal lengthwise, so that the centers of the projections of the movable cutter were above the points between the ends of the loops previously formed and again shifted the sheet metal over the edge of the fixed cutter in a direction transversely to the length of the edge, and again forced the movable blade downward, and thereby again produced a row of loops or arches and then again shifted the metal lengthwise and transversely, as stated above, and made another row of loops or arches, 253 and thus produced an open mesh piece of metal like the Golding, Johnson, or Long expanded metal. The Bostwick or Elkins lath and the expanded metal were both on the sheet and integral therewith, and were both made on the same machine in the same manner, and the machine was operated in precisely the same manner at all times, in fact it could be operated only in one way.

Answer objected to as incompetent.

Defendant's counsel does not understand in what sense the answer of the witness is said to be incompetent, as it is a direct statement of the witness' own acts.

Q. 24. Will you, before signing your deposition, annex to it or have the notary identify as an exhibit, a piece of lathing illustrating your last answer and showing the two kinds of meshes or reticulated portions along the two different edges of the sheet?

A. Yes, I will.

Q. 25. In order to aid opposing counsel can you produce for his inspection anything of this sort at the present time?

A. I herewith produce the sheet I have referred to and would call attention to the fact that at the edge part two of the loops are now broken. This sheet was not broken in making it and was intact when it was taken away from the machine and must have been broken in handling or laying around.

The small sheet produced by the witness in its present injured condition is offered to complainant's counsel for inspection and defendant's counsel will offer a perfect example of the same in evidence as indicated above.

Complainant's counsel states that as it appears that the 254 sample produced was the one actually produced by the witness while performing the experiments referred to in Q. 23, he must insist that this sample be made an exhibit in this case and if it is not he will insist upon his objection to Q. 23.

Q. 26. In the Golding patent in suit I notice that the claim employs the term "bars." Does reference to the specification show any use or definition of the word "bars" as employed in the claim?

A. It does not.

Q. 27. Please state what meaning can or might be given to the word "bars" in the claim in attempting to have it apply correctly to the process set forth in the specification?

A. The only meaning that this word could possibly have would be the slit portions because portions of the metal are simultaneously slit and bent and they are bent in such a manner as to stretch or elongate the slit portions and the slit portions are the *only* parts of the sheet that are stretched or elongated and in fact are the only portions that can be stretched or elongated. But even this substitution does not make the claim clear at all, because then the claim would read in part "simultaneously slitting and bending portions of a plate or sheet of metal in such manner as to stretch or elongate the slit portions connecting the slit portions and body of the sheet or plate," and that if anything is more obscure than the claim as it now reads. I find that the word "bars" and the words "slit portions" are used in the claim and are only separated from each other by the word "connected." If these words are used to define different parts than I cannot find one of the parts, and if they both define the same parts, I can find no use of the word "connecting" nor can I make any sense out of the claim. There are no other parts to which this word "bars" could be applied.

255 Q. 28. The phrase of the claim employing the words "stretch or elongate the bars connecting the slit portion and body" is used in respect to the very first row of slits and bends that are formed, is it not? So that the word cannot mean or have reference to a plurality of rows of previously formed meshes, but only to the first single row, is that correct?

A. The claim says that portions of the sheet of metal are simultaneously slitted and bent in such a manner as to stretch or elongate the bars connecting the slit portions and body of the sheet metal or plate. That is the first step of the method and relates of course only to the first row of such slits made because the claim then goes on to say "and then similarly slitting and bending the places alternate to the first mentioned portions," which is the second step of the method of the claim.

Q. 29. In this sample that you have produced were the meshes of the Long or Golding type made by exactly the process of the patent in suit and by the employment of means or cutters of the same type as in the patent in suit.

A. The cutters were of the same type although slightly different in shape and the Golding, Johnson mesh on the sheet or sample was made according to the claim of the Golding patent, as I understand it, that is, by making one row of punchings, thereby slitting and simultaneously bending the slit portions and then shifting the metal so that the next row of punchings will be offset and by the second step the metal is again slitted and at the same time bent and stretched. Of course this process as I have just now described it was also used in making the rest of this sheet which represent the Bostwick or Elkins lath. In fact all I did was to place the metal in the machine and turn the crank and than shift the metal lengthwise and transversely and then again turn the crank.

Q. 30. What I asked was whether you made the *machine*
256 in the edge of this sheet, which are of the Long or Johnson or Golding type by exactly following the Golding process as set forth at length in the patent in suit.

Objected to as incompetent.

A. The claim as exactly set forth in the patent in suit says that the portions shall be slitted and bent in such a manner as to stretch or elongate the bars connecting the slit portions and body of the sheet or plate, and as I do not know just what that means and did not know, I could not exactly follow the exact wording of this claim. I did follow the process as described in the specification of the patent in suit.

Recess.

Q. 31. In the specification of the patent in suit after the statement of the invention in which the inventor says: "The invention consists in the improved method of making expanded metal, viz.: by simultaneously cutting it and opening or expanding the metal at the cuts by stretching the severed portions" the inventor proceeds to state what he prefers to do in carrying out the invention, lines 34 to 47, saying, "I prefer to make a series of slits in a straight line across the edge of the sheet, and at the time of cutting the slits and as a continuation of that operation to depress or stretch the severed metal, etc.," "without any contraction." Is it not a fact that in prior patents and also in your demonstration in making this sheet that you have produced, a double series of slits in a straight line across the edge of the sheet were made and the severed metal was depressed and stretched at right angles to the sheet and "without any contraction from the length of the original sheet?"

A. Yes, that is true.

Q. 32. By this statement "I prefer" etc., and having in view the claim, do you understand that the claim is limited to first
257 making a series of slits in a straight line across the edge of the sheet or that it was intentionally worded to give force to the expression "I prefer," so as not to distinguish between making a single slit and a series of slits in the first step?

A. As I understand the claim it is drawn to include making a series of slits in a straight line across the edge of the sheet as well as making the slits singly or one at a time. Of course I understand that the slitted part is depressed and stretched simultaneously with the slitting in either case.

Q. 33. In the next paragraph of the specification commencing line 47 the inventor states the alleged fact that his invention allows the use of a single straight knife and upper cutters arranged in a straight line. Is or is not this whole paragraph equally true of the forms of Bostwick, Ohl and Elkins lathing, with the exception that two straight under knives instead of one may be employed?

A. It is.

Q. 34. And in the succeeding paragraphs from lines 60 to 82, is or is not the description of the tools or apparatus employed applicable to the tools and apparatus that you employed in making the example of Bostwick or Ohl lath that you produced?

Objected to as incompetent.

A. It is.

Q. 35. In the next sentence of the specification, are the facts alleged equally true of the Bostwick, Ohl, or Elkins laths; and if yes, please quote the sentence?

A. It is. The Golding specification of the patent in suit states on the beginning of line 82, "It will be noticed that at the time the bend is imparted to the severed portion, there can be no contraction in the product from the length of the sheet A, because the 258 ends of the severed portion or strand are still integral with the sheet and will not permit it." That is precisely the case in making the Ohl, Bostwick or Elkins lath.

Defendant's counsel offers in evidence the sample of lath produced by the witness, and it is marked "Defendant's Exhibit, Gunz Sample Broken."

Q. 36. Mr. Golding in his testimony has dwelt at some length on the alleged advantage and improvement in the structure of the metal by the stretch or elongation which is caused during the operation of the process in suit. Please give your opinion as to whether there is any suggestion in the patent in suit of this being advantageous, and also whether there is any information or direction given in the patent as to the kind of metal to be employed?

A. The specification only states that sheet metal is to be employed, but says nothing further as to the kind of metal, and I understand it to include all sheet metals. I find nothing in the specification to the effect that any advantage of improvement in the structure of the metal is obtained by the stretch or elongation caused during the producing or making or by the producing or making of the expanded metal in the manner set forth in the patent.

Q. 37. The figures given by Mr. Golding in his testimony show a stretch or elongation of how many per cent.?

A. Ten per cent.

Q. 38. Could or could not any advantageous results or necessary hurtful results be produced by such stretching of the strands, assuming that ordinary commercial sheet iron or sheet steel were employed?

A. No advantages whatever could be gained, because the metal is subjected to a forcible treatment both in slitting, bending and 259 stretching, all of which tends to increase the brittleness of the metal and decrease its tensile strength; and furthermore by the stretching of the strands, that part of the metal forming the strands is made thinner than that part of the metal which is not stretched, and the metal is subjected to very great strain at the points where the stretched members are connected with the part of the original sheet that are not stretched, all of which tends to weaken the metal. In fact, by this treatment of the metal it is hardened so as to necessitate annealing to a greater or less extent. Of course this tendency to heat and harden increases with the thickness of the sheet of metal and is therefore much greater in thick metal than in thin metal, but in all cases it is disadvantageous to stretch the metal in the cold state, as is done in carrying out the process described in the patent.

Q. 39. Is it or is it not customary in cold-drawing metal, as for example in wire drawing, to anneal so as to overcome the deleterious effect of the stretching or elongation of the metal?

A. Yes, that is customary and I myself have practiced it in gold, silver, copper, brass, iron and steel.

Complainant here waive- proof of the fact that some of the sheets under complainant's process are annealed and others are not.

Q. 40. Please give your opinion as to whether, except for the extra trouble and expense, the sheets produced by the process in suit should be annealed for the purpose of removing as far as possible the deleterious effect of the stretching?

A. They should be annealed for the purpose of avoiding these deleterious effects as far as it is possible.

Q. 41. When the strength of the sheet is to be relied upon as for example where it is employed to strengthen concrete work, does this
make the annealing more or less important, and give the
260 reasons?

A. For such use the annealing is of very great importance, because when used in concrete work the expanded metal should have the greatest possible tensile strength as it is provided for the purpose of strengthening or reinforcing the concrete which alone and without such a reinforce would not be strong or safe enough.

Q. 42. Assuming that the complainant seeks to lay stress upon the regularity and accuracy of shape of the meshes, as actually produced by the complainant's licensees, in carrying out the process by means of patent 581,713 for mechanism or machine, is such alleged regularity as compared with the lathing of the earlier Golding process due to a difference in process or to the mere accuracy of the machine employed, and would such regularity result in the carying out of the process in suit by the mere means shown in the patent in suit aided by the employment of chisels, hammers, or other devices, such as Mr. Golding referred to in his own deposition?

A. This regularity is entirely the result of careful construction of the machine and has nothing whatever to do with the process because the process can be carried out without producing such regularity. Such regularity would not necessarily result from the means shown in the patent because the means could be used and the process carried out as described in the patent without at all producing such regularity.

Q. 43. On the assumption that the drawings and statements contained in the earlier Golding patents are to be taken as true by all persons claiming under the Golding patents, please give your opinion as to whether the lathing as produced by the machine of Golding patent 320,241 and illustrated in Fig. 1 and Fig. 12, also the illus-
tration of lath as issuing from the machine in Golding patent
261 381,230, Fig. 1, and the lathing set forth in the patent
320,242 (process patent), all show that the meshes are per-

fectly regular and (with the proper design and movement of guides) would necessarily be perfectly regular, and please answer particularly with respect to the location of the long axes of each mesh being at right angles to the short axes and the lines through the intersections of the strands in one direction being at right angles to the intersections in the other direction and the uncut interval between strands lying at right angles or perpendicular to the plane of an individual mesh or opening and therefore approximately perpendicular to the general plane of the expanded structure?

A. The expanded metal produced by the machines described in the patents you have referred to are shown to be absolutely regular and uniform and there is absolutely no reason why it should not be so if the machine is properly constructed and properly operated. Lines drawn through a series of diamonds in one same straight line lengthwise of the diamonds are intersected at right angles by lines drawn through rows of diamonds at right angles to the first rows, which latter lines pass through the short axes of the diamonds and the uncut intervals between strands that are perpendicular to the plane of an individual mesh are approximately perpendicular to the general plane of the expanded structure.

Q. 44. Illustrating my meaning by Figs. 1 and 2 of Golding patent 297,382, does not the symmetry and equilateral form of mesh where the strands are not stretched or are stretched evenly, depend primarily on whether the successive rows of slits are located exactly opposite the intervals between the slits in adjacent rows or whether they are not so placed?

A. It does, because if the slits were not arranged with abso-
262 lute regularity it would be impossible to obtain the absolute
regularity in the product.

Q. 45. Is the patent in suit directive or silent in regard to making the alternate slits directly opposite the intervals or not? And would the claim apply as well to the formation of meshes with two short and two long sides?

A. The patent does not say that the slits shall be directly opposite the preceding intervals, but only says that the slits of unsevered portions shall alternate in position at successive operations. There is absolutely nothing in the claims that would exclude making expanded metal in which the meshes had two short and two long sides.

Q. 46. Does the Golding patent in suit contain any directions or information concerning how much stretching is permissible or as to whether the process is not in fact limited to ductile metals?

A. No, it does not give any information on either of these points.

Q. 47. If the claim of the patent in suit had contained the additional limitation "and by each successive slitting and stretching operation forcing the metal already operated upon further away from the original plane of the sheet," would not this at least have distinguished in terms of mechanical effect or displacement from the Ohl patent?

A. It would have distinguished the article produced from the Ohl patent.

Q. 48. Was not such a qualification present in the original second claim in the application of the patent in suit, which was thereafter cancelled when the present claim without any such definition was inserted?

A. This qualification was contained in the original second claim and this claim was cancelled and the present claim substituted for it.

Q. 49. Are or are not the purely mechanical functions of well
known metal cutting and stretching or forming tools or
263 mechanism essential to the existence or carrying out of the
Golding process in suit?

A. They are, and without them the process could not be carried out.

Q. 50. Is not the Golding process also dependent on the shape and joint action of mechanical cutters or forms?

A. It is, because without such properly formed cutters and the joint action of the same, it would be impossible to carry out the process set forth in the patent.

Q. 51. Can the Golding process exist or be carried out as chemical and other analogous processes may be independently of the mechanical co-operation and the mechanical functions of two co-operating cutters or shears or dies, one at least of which has the further mechanical functions of bending and of stretching the metal on which it acts?

Objected to as misleading, in that the bending and stretching of the metal are not functions of the cutter, but effects produced in the molecular character of the metal.

A. It cannot, because two co-operating cutters or like mechanical contrivances are absolutely necessary and one of them must be so shaped as to act on the severed metal in such a manner as to bend and distort the same and at the same time cause a stretching of this severed metal.

Q. 52. Is it in any sense true in your opinion that the "bending and stretching of the metal are not functions" of the mechanism?

Objected to as incompetent.

A. They are, for if the mechanism were not present or if they were present and were not operative, the metal would not be bent and stretched simultaneously with the slitting or bent or stretched at all
in this process, or in the act of making the expanded metal.
264 The metal will not bend or stretch of itself, and the only thing
that could make it bend or stretch is the set of cutters, which
must be shaped accordingly.

Q. 53. In what sense, if any, do the "effects produced in the molecular character of the metal" differ from the effects produced in the Bostwick, Elkins and Ohl strands?

A. They do not differ in any respect whatever. They are all precisely the same.

Q. 54. Wherever in the metal working art, dies of any particular shape are employed to impress such shape upon sheet metal, are not the mechanical functions of such dies necessarily productive of molecular motion and change in the metal undergoing treatment?

A. They are, and if such molecular changes would not take place the functions of the dies could not and would not perform the functions for which they were used.

Direct examination closed.

Adjournment to Wednesday, April 19th, 1905, 11 A. M.

NEW YORK, WEDNESDAY, *April* 19, 1905—11 a. m.

Met pursuant to adjournment.

Defendant's counsel offers in evidence all the patents referred to by the witness, to wit, Golding, 297,382; Golding, 320,240; Golding, 320,241; Golding, 320,242; Golding, 381,230; Golding, 381,231; Golding, 581,713; also Brandon, 385,405; Bostwick, 459,625; Bommarius, 309,375; Crittenden, 489,850; Curtis, 460,850; Elkins, 408,599; Ekstrom, 385,663; Hayes, 519,952; Israel Kinney, 312,864; Cyrus Kinney, 432,141; Miller, 238,417; Nesmith, 94,333; Ohl, 475,700; Sagendorph, 447,085; Stone, 459,726; Stone, 459,727; also British to Long and to Johnson. 265

And the same are marked with the words "Defendant's Exhibit" and the names of the respective patents as given above.

Cross-examination by Mr. HUNTER:

X Q. 55. Of all of the patents to which you have referred in the course of your direct examination and of which copies have been offered in evidence, which, in your opinion, most closely approximates the method of making expanded metal, described in the complainant's patent in suit?

A. All these patents have close relation to each other and show means for punching, slitting and expanding metal at the same time, or they show sheet metal articles in which parts have been slitted, bent and stretched simultaneously. It is impossible for me to pick out any one patent as particularly showing the process of making expanded metal. The claim of the patent in suit is for an alleged process of operating on metal by simultaneously slitting the metal at certain parts and bending and stretching the slit parts and then performing the same operation in another part of the sheet. That is practically shown in all the patents that I have referred to.

X Q. 56. Then I understand from your answer that you had no preference with reference to these various patents but think them all equally pertinent?

A. No, I do not, because some of them show methods of making expanded metal and others show means of making metal in which parts are bent and stretched, the same as in the process described in the patent in suit and others show articles made by a process like the one defined in the claims of patent in suit; and while some of these patents may show the process or the article to a better degree than others, I cannot point particularly to any one patent, and the best I could do would be to repeat the testimony that I have already given in which I have pointed out to what extent each and every patent has a bearing on the matter at issue and to what extent it has influenced my opinion as expressed. 266

X Q. 57. I understand that of these patents some refer to what is known as expanded metal and processes and machines for producing it, while others refer to punched metallic lathing which is not expanded and machines for its production, is this correct?

A. In some respects, because what is known as expanded metal is also used as lathing at the present time, and if I am not misinformed is used to a greater extent than the lathing shown in the patents I have referred to, and on the other hand this lathing is not merely only punched, but the parts acted upon by the punch are also expanded to the same degree that the meshes of the expanded metal of the patent in suit are expanded. I mean the strands forming the meshes. If the same punching shown in the lath patent that I have referred to are made in the same succession as they are made in the article produced by the process of the patent in suit, then this lathing is converted into expanded metal, and, on the other hand, if the intervals between the successive punching operations in the process of the patent in suit are made as great as the intervals between the punchings of the metal lath shown in the patents I have referred to then the process of the patent in suit will produce such metal lath as distinguished from the general term or descriptive term of expanded metal.

267 X Q. 58. When I use the term "expanded or expanded metal" will you please understand that I am using it in the sense I understood you to use it in your direct testimony, when for the purpose of preventing confusion you made the distinction between "stretching" and "expanding"; and I will ask you also to prevent confusion to use terms in the same sense on your cross-examination that you have used them in your direct examination; with this explanation of what is meant by me when I speak of expanded metal is it not true that of the patents to which you have referred in your direct testimony some refer to what is known as expanded metal and processes and machines for producing it, while others refer to metallic lathing which is not expanded and machines for its production.

Defendant's counsel objects to the question as misleading and tending to make confusion worse confounded inasmuch as the prior patent in evidence show expanded metal sometimes with and sometimes without stretching, for example, the Israel Kinney patent, while others show cutting and stretching without any great expansion either of thickness or of area. The objection is made rather as a suggestion than as a criticism.

Complainant's counsel calls attention to the fact that the feature of stretching, *i. e.*, elongation of strands, is entirely eliminated from his question.

A. Some of the patents relate to what is known as expanded metal in which the area of the sheet is enlarged by opening the mesh and others relate to metallic lathing in which the area of the sheet is not enlarged by opening the mesh, and in that respect the latter are distinguished from expanded metal.

268 X Q. 59. Do you consider this a proper definition of "expanded metal" as we are using the term in this case, to wit, a unitary reticulated or open mesh sheet formed by expanding a sheet of metal into a greater area than the original blank.

A. Yes.

X Q. 60. Will you please name all of those patents to which you have referred which relate to expanded metal and machines and processes for making it?

A. All of the patents that I have mentioned relate to processes or show the result of processes by which same process expanded metal can be made. The patents which in terms refer particularly to the article or to machines for making the article are the following: British patent 2,125 of 1862 to Long; the Johnson British patent; all the Golding patents; The I. Kinney patent 312,864; and the Ekstrom patent 385,663.

Defendant's counsel adds the Ekstrom patent to the list of patents already offered. By consent it is listed in the list already offered.

X Q. 61. Now, of these patents which relate to the expanded metal, which one, in your opinion, most closely approximates the method of making expanded metal described in the complainant's patent in suit?

A. If you mean by these patents those that I have especially enumerated I will say that they all equally well refer to expanded metal as we have used the term. I did not say that these patents related any more to the particular process in suit than did the remaining patents which I have not enumerated by name or number in my last preceding answer.

269 X Q. 62. I will ask you to eliminate from consideration entirely these other patents which do not show or describe expanded metal and to consider for the moment only those patents which remain in your answer to X Q. 60 as referring particularly to the article or to machines for making it, and ask you which one of those patents, in your opinion, most closely approximates a disclosure of the process or method described in the complainant's patent in suit?

A. In X Q. 59 I was asked to name those patents which "relate to expanded metal *and* machines and process for making it." In the present question appear the words "to the article *or* to the machine." If question 60 had read "to machines *or* processes, I would not have referred only to the Golding patents and those contained in my answer to X Q. 60, because then I would have included *all* the patents I have discussed. The patent which I mentioned in my answer to X Q. 60, namely, the Golding patents, the Long British patent, the Johnson British patent, the I. Kinney patent and the Ekstrom patent were patents which referred to "expanded metal *and* to machines and to processes for making it." I cannot select from these patents any one as being the best reference in regard to the article *or* a machine or the methods because in that case I would be excluding a large number of patents which, as far as the process *per se* is concerned, are better anticipations, in my opinion, than the patents particularly enumerated in answer to X Q. 60. And, if I would answer without considering the other patents, I would not be giving the Court the proper information.

X Q. 63. Do any of the other patents describe, show, or refer, to expanded metal. I do not ask for any inferences or theory upon your part as to whether the processes described in those patents might be applied to the making of expanded metal or whether the patents themselves show, describe or in words refer to expanded metal?

A. They do not refer to the article as such.

270 X Q. 64. Then considering only those patents which do describe or refer to expanded metal as such, which you have stated to be the Long and Johnson British patents, the Golding patents, the I. Kinney patent and the Ekstrom patent, which one in your opinion most closely approximates a description of the process or method of making expanded metal described in complainant's patent in suit?

A. That I cannot answer because these patents have only been grouped by me as referring to the article and not to the particular process of the patent in suit.

X Q. 65. Do you desire the Court to understand that it is your opinion that the process or manner of making expanded metal which is disclosed, for example, in the Long and Johnson British patents and in the Golding 1884 patent, as closely resemble or approximate the method or process described in the complainant's patent in suit as does the process described in the Golding & Durkee process patent 320,242?

A. No, I don't see that I could say that to the Court without contradicting what I have already stated in my direct testimony, where I called particular attention to the fact that in some of the Golding patents the entire sheet was slitted and then all the meshes opened; whereas in other patents the Golding, the slitting and opening was done step by step. In that particular the Golding patents 320,241, 320,242, 381,230 and 381,231 approach the process of the patent in suit closer than the other patents of Golding or those that I have mentioned in my answer to X Q. 60, but they do not approach it nearly as closely as the other patents which I have discussed which relate to making metallic lath such as Ohl, Stone, Elkins, Bostwick, Sagendorph and others.

271 X Q. 66. Now, of these patents which do not refer to expanded metal as such, will you please state which one in your opinion most closely approximates a description of the method or process of making expanded metal which is described in the complainant's patent in suit?

A. I fail to see how I can point out any one patent in particular, as I have already stated that they all show either the process or the result of the process as defined in the patent in suit.

X Q. 67. I note that whenever you have been referring to the patents of this class you have generally mentioned the Ohl patent. May we not take the Ohl patent as being fairly representative of this entire class, or have you some other patent that you would prefer?

A. No, I have no preference one way or the other, as I have already stated they all show that the process of the patent in suit is made use of, and the tests which I made show that, by carrying out the process of the patent in suit, lath such as the Ohl, Bostwick, Elkins or other lath can be made, and on the same sheet of metal

h the same process expanded metal can be made as set forth in
patent in suit. Instead of calling the metallic lathing on the
cimen which I have produced Ohl lath, I could just as well have
led it Elkins or Bostwick lath.

X Q. 68. Referring now to the Ohl patent, it is the fact, is it
, that with each operation of the cutters in making a row of
ps, the cutters make simultaneously two parallel cuts or incisions
which means the edges of the loops are severed from the body of
sheet?

A. By carrying out this process with this particular machine of
Ohl patent that is true.

X Q. 69. And to effect that result it is true, is it not, that Ohl
uses one upper and two lower cutters, the upper cutter pass-
2 ing between the lower cutters and the two edges of that cutter
acting in conjunction with the lower cutters?

A. In carrying out the process in that particular machine, that
o.

X Q. 70. And in making the sample, which you have produced
illustrate the result of the Ohl process, did you use this system of
upper and two lower cutters?

A. The process which I wish to illustrate is not limited to the use
two lower cutters, but may be carried out with two lower cutters,
I used only one lower cutter, and the specimen shows that such
h can be produced when using only one lower cutter.

X Q. 71. Did you simultaneously make the two parallel incisions
ich sever the edges of the loops from the body of the sheet?

A. I made these incisions simultaneously and gradually and at
same time bent and stretched the metal between them.

X Q. 72. You had but one lower cutter?

A. Yes.

X Q. 73. And I presume the slit or incision on one side was
de by the co-operation of one cutting edge of the upper cutter
th the lower cutter, is that correct?

A. Yes.

X Q. 74. What made the incision on the other side?

A. Some support for the metal that I cannot remember the de-
ls of.

X Q. 75. You mean that you had on the outer side as was prob-
ly necessary a support for the sheet of metal, so that the other edge
the upper cutter would be able to cut the sheet, is that correct?

A. I think that is correct?

X Q. 76. Do you recollect whether you referred to this support
on the other side of the sheet in your direct testimony of the
3 machine you used to produce the experimental sample, which
has been offered as an exhibit?

A. I don't think I did.

In view of the fact that the description of the machine as given
the witness in his direct testimony was not as is now admitted
full and complete description of that machine, and as he now
ates that he is not able to remember the details of the construction

that was used by him in the production of this sample, the exhibit and all testimony with reference thereto, is objected to as incompetent, irrelevant and immaterial.

Defendant's counsel understands this objection to call for the production of the machine, although even in that aspect the direct testimony of the witness is in no sense incompetent so far as can be understood by the objection. Defendant's counsel has no objection to producing the machine and repeating the experiment for opposing counsel's benefit, and preferably in open court.

By Mr. HUNTER: Whether or not defendant's counsel sees fit to produce the machine in view of the objections that have been noted is a matter for him to decide.

Whereupon, defendant's counsel asks that the objection to incompetence be made clear as required by the rules of evidence, so that if there be any defect it may be cured at this time.

Complainant's counsel thinks that the objection is amply sufficient, but as defendant's counsel desires a bill of particulars, it is suggested that when a witness claims to have made certain experiments by the use of a machine which he does not produce and only partially described, and the details of which in a very essential particular he admits he cannot remember, the secondary and incompetent character of the testimony with reference to such a machine and its results should be manifest. 274

X Q. 77. Now in using this machine for the purpose of producing upon it expanded metal of the character described in the complainant's patent in suit and causing such machine to perform the process of that patent, what use did you make of this support for the metal that you cannot remember the details of which you used in producing the Ohl lath?

A. I did not say that I did use a support. So far as I know there was something there to support the metal but I did not make any change whatever in this machine after making the so-called Ohl lath but produced the expanded metal on it. I could do it just as well on the Ohl patent machine without making any changes, or at least on a machine having two cutters. All that would be necessary would be to feed the metal over the edge of one cutter, I mean lower cutter or rest, a distance equal to the width of the strand to be produced and then the upper cutter would shear off and bend and press down strands of metal as in the shape of the Ohl arches and a width equal to the projection of the edge of the metal over the lower cutter or rest, the ends of these strands being connected with the body of the metal precisely as in the article produced by the process of the patent in suit. Of course, in such case I would not use the whole series of upper cutting disks as in the Ohl patent but only one disk for example, as shown in Fig. 4 of the Stone patent 459,727, or in Fig. 2 of 459,726 to Stone. Then I would shift the metal over the cutting edge the same distance as previously shifted and move it lengthwise to offset the cuts and would again operate this rotary cutter lengthwise of the lower blade and would thereby produce a second row of strands, and so 275 on, the expanded metal produced passing down between the two lower cutters.

X Q. 78. It is all very interesting to learn how you change the Ohl machine and its method of operation for the purpose of producing expanded metal like that described in complainant's patent in suit by a similar process, but it would, perhaps, be more to the point if you were able to direct the attention of the Court to a patent disclosing a machine which was designed and intended by its maker to be used in this manner; are you able to refer to any patent of that kind other than Mr. Golding's machine patent No. 581,713?

A. I do not understand that this matter relates to a machine patent and that I am expected to produce a machine patent for carrying out the alleged process. The process, if it is one, can be carried out by any machine that will do it, and the process as defined consists in simultaneously slitting and bending portions of a plate of sheet or metal in such a manner as to stretch or elongate the parts so separated, simultaneously while slitting and then similarly slitting and bending in places alternate to the first-mentioned portion, and that certainly was done by any of the machines that made the lath. Ohl invented a machine and illustrated it and described it and this machine was made for the purpose of simultaneously slitting the bended portions of a sheet of metal in such a manner as to stretch or elongate the slitted portions and to then simultaneously slit and bend in places alternate to the first-mentioned portion. For his purposes he desired to produce an article of a certain design and in which the metal was slitted and bent in the manner that I have set forth, and in order to make this article of a certain design he constructed his machine accordingly. If I or another person wishes to make use of
276 the Ohl machine without departing from the process but for making a different design it is evident that the machine must be changed to make this new design, but this does not in any way affect the process which always is the same and always remains the same and cannot be any different.

X Q. 79. Now will you please answer the question?

The question is objected to as improper in view of the preceding question and answer which called upon the witness to refer to any patent designed and intended to be used in a certain *manner*, and not defined by the article, and it would seem that the witness had fully and fairly answered this both literally and substantially.

A. I understand that this entire litigation relates to a process, and any machine that will carry out the alleged process is as good as any other. I have already pointed out that I do not know of any machine except Mr. Golding's which was designed for the particular purpose of making sheet metal in this particular manner, that is, according to this particular design; I mean expanded metal in which the process of the patent in suit is carried out.

Recess.

X Q. 80. Now when you operated this experimental machine to produce expanded metal of the character described in the complainant's patent in suit and by the process of that patent, did you support the metal on the outer side of the incisions by means of this support that you used when making the Ohl lathing?

A. No.

X Q. 81. And in the operation of your experimental machine in making this expanded metal of the sample you have produced, one cutting edge only of the upper cutter operated upon the metal? 277

A. Only one.

X Q. 82. It is a fact, is it not, that in the metal lathing produced by the machine of the Ohl patent there is a continuous uncut strip of metal between each row of loops?

A. There is in the particular construction of the machine illustrated because this machine was built or constructed to make lathing of a certain design, but whether such strip of uncut metal is present or not that does not in any way affect the process of making the loops or projections.

X Q. 83. And to make expanded metal of the character shown in the Golding patents, including the patent in suit, there is not and necessarily must not be such a continuous uncut strip between adjacent rows of strands?

A. No, for the design is an entirely different one. I mean the design of the article.

X Q. 84. Is it not the fact that if in the machine described in the Ohl patent the cutters were so arranged or the metal was so fed that the successive rows of loops would be immediately adjacent to one another without any intermediate strips of uncut metal, the sheet would merely be severed into separate strips. You will understand of course that the cutters are to operate as shown in the Ohl patent, that is to say, each set of cutters must form the loops by severing the metal on both sides. As it would probably be impossible to make these series of rows of cuts immediately adjacent to one another with a series of cutters, you may suppose a case in which a single row of cutters is employed and the metal is fed transversely, and also moved longitudinally sufficiently to bring the loops into the alternate positions shown in Fig. 10?

278 The question is objected to as assuming physically impossible conditions, unless the seemingly contradictory limitations of the conditions are eliminated.

A. As I understand the question the Ohl machine is to be so operated that the upper cut of the lowest row of loops, Fig. 10 of the Ohl patent, coincides with the lower cut of the second row of loops from the bottom, that is to say it is to be so operated that one cutting edge of the upper knife *b* or angle of such knife and the corresponding lower knife *h* do not perform any functions. They cannot perform any functions because their function is to shear and there is nothing there to be sheared. If then this useless lower blade still remains in place it will support the plate in flat condition and the loops previously made will rest upon this outer lower blade *h* and will prevent the metal from properly coming in contact with the inner lower blade and the result will be a plate that is neither fish nor flesh, absolutely nothing beyond a plate full of useless cuts and bent and twisted loops and without any usefulness or purpose whatever.

X Q. 85. What I understand you to mean by your answer is that with the machine shown in the Ohl patent operating in the manner described in that patent it would be impossible to form the series of rows of loops without the continuous strips of uncut metal between adjacent rows of loops, is that correct?

A. It would not be possible to make "successfully" any other design of lathing than that for which the machine was designed and built, because this particular machine would be used improperly if another design were made. For such other design corresponding and slight changes would have to be made without however in any way affecting the process which always remains the same.

X Q. 86. Does your answer mean yes or no?

Objection repeated.

279 A. It is impossible to answer this question yes or no because it is based on so many changes that neither yes nor no would be a proper answer.

X Q. 87. You are entirely mistaken in supposing that the question is based upon any changes whatever. I have merely asked you whether, in your opinion, it would be possible, with the machine shown in the Ohl patent, operating in the manner described in that patent, to form the series of rows of loops without continuous strips of uncut metal between adjacent rows of loops? You are certainly capable of answering that question yes or no.

A. I have already explained my understanding of the machine. It certainly would be possible to do this on the Ohl machine if you would remove those parts of the Ohl machine which destroy that which was previously made. If you used both cutting edges of the upper knife and used both lower knives and one cutting edge of the upper knife and one of the lower knives are superfluous and are in the way of doing that which you intended to do and in fact destroy what you have done it is evident that the machine will not work properly, especially as it is being worked in a manner for which it was not designed, that is, for producing a different design of article.

X Q. 88. Does this answer mean yes or no?

A. The answer means just what it says; this question cannot be answered yes or no for either answer could easily be construed to mean something different from that which I wish to express. I will try to express that in other words. If one lower blade is removed, and the sheet is fed forward, the width of the upper blade, then the severed metal will be gradually forced down at the sides of the remaining lower cutter and open mesh produced. If on the other hand the outer lower cutter is not to be removed, and the metal is fed forward in the same way so that the inner edge of one row of
280 loops will coincide with the outer edge of the other row of
loops, and no strip of uncut metal is left between the row

of loops, then an article will be produced which is neither one thing nor the other.

X Q. 89. For some reason which I do not understand you seem unwilling to make an answer to a perfectly clear and intelligible question. You are not to make any change in the construction of the Ohl machine and I ask you whether in your opinion it would be possible with that machine operating in the manner described in the patent, to form the series of rows of loops without the continuous strips of uncut metal between adjacent rows of loops?

A. The question is now coming down to this, namely, whether with the Ohl machine as it is you can form the design of the metal lath for which the machine was built, or another design. I have said all along that the Ohl machine was built for a certain design of metal lath and that unless the machine was changed slightly you could produce that design only and I think that fully answers the question as far as the design of the machine or of the article produced is concerned, and still the process always remains the same.

X Q. 90. Does this answer mean yes or no?

A. It means just what it says. That on the Ohl machine built for making a certain kind of lath, *i. e.*, a certain design of lath, no other design of lath can be made unless changes are made in the machine.

X Q. 91. Do you refuse to answer this question yes or no?

A. If the question is as I understand it and as I have repeated it in my last answer I have answered it affirmatively a number of times.

X Q. 92. Then I understand that it is your opinion that with the machine shown in the Ohl patent unchanged in any particular and operating in the manner described in that patent it is possible
281 to form the series of rows of loops without continuous strips of uncut metal between adjacent rows of loops, is that correct?

A. No, that does not at all agree with my previous answer.

X Q. 93. Then if that is not correct, it is your opinion that without any change in the Ohl machine operating in the manner described in the Ohl patent it would not be possible to form the series of rows of loops without continuous strips of uncut metal between adjacent rows of loops, is that correct?

A. That is what I have always maintained. Of course I wish to add to what I have already said before that the process that I have found in the Ohl patent always remains the same, and whenever the Ohl patent machine operates it always slits the metal and bends and stretches the slitted parts and does so successively at different parts of the sheet.

The last part of the answer is objected to as improper, irresponsive and an attempt to interject matters of argument into the record. The attention of the Court is here called to the unwillingness of the witness to confine himself to the questions asked and to make direct and intelligible answers to them.

X Q. 94. Have you examined expanded metal made under the method of the Golding & Durkee patent 320,242 and by machines of the character shown in the Golding & Durkee patent 320,241 and the Golding patents 381,230 and 381,231, and if so, to what extent?

Defendant's counsel, in view of the fact that he has not had access to such a machine of the complainant's, asks if proof of the fact that this sample of lath (indicating) is such a piece of lath as is inquired of in the question, so that the witness may so assume in answering the question.

282 As this question is asked for the purpose of ascertaining what, if any knowledge, the witness has of expanded metal of the character referred to in the patent mentioned in question, complainant's counsel must decline at the present time to give the information; if the witness is not able to tell from the sample, and if that sample is all he has seen, he should like to know it.

Defendant's counsel objects to the question as misleading, in coupling together the product of a particular process as made by a particular machine, and it was for this reason that he asked that the sample might be admitted in view of the fact that the complainant's exhibits are not here present, but Mr. Golding the inventor is here present and can certainly save proof.

For the reasons stated complainant's counsel declines to give the information at the present time, or at least until after this question is answered.

A. I have examined expanded metal very frequently for quite a number of years, but I don't know on what machine it was made and never had any chance of seeing the machines that made it. I have also examined expanded metal made under the methods of the Golding & Durkee patent 320,242, but I don't know whether it was made on the Golding & Durkee machine of patent 320,241, nor on the machines shown in patents 381,230 or 381,231, as I have never seen these machines in operation.

X Q. 95. To what extent have you examined expanded metal, made according to the patent 320,242?

A. I don't know what you mean.

X Q. 96. I mean how many different pieces have you examined?

283 A. That I don't know. Many of the pieces I have previously examined may have been made according to this process. I did not keep any account of the number of pieces that I examined or the particular make.

X Q. 97. Have you ever examined any large pieces of expanded metal of the character shown in patent 320,242?

A. I have examined many large pieces of expanded metal, and as far as I can recollect they were in appearance exactly like that shown in patent 320,242.

X Q. 98. Do you mean to say that in those large pieces of expanded metal that you have examined the major and minor axes of the meshes were at right angles to one another, and that the lines through the intersections of the meshes in one direction were at right angles to the lines of intersection of the meshes in the other direction?

A. No, I think they were not. I am pretty sure they were not, though I did not take the trouble of measuring the angle, but judging from the appearance of the sheets, as I recollect them, the lines were not at right angles to one another.

X Q. 99. You have said that this regularity or the lines being at right angles to one another as mentioned in the preceding question and answer are not essential results of the process described in the patent in suit because that process could be carried out without producing that regularity. Am I correct in this understan-ing of what you have testified?

A. I think the process could be carried out without producing such regularity.

X Q. 100. Now do you think that this regularity could be produced, by that I mean commercially, without using this process of the patent in suit, and if so by what process?

A. This regularity exists in the expanded metal of the process of
patent 320,242 which clearly shows great regularity in the
284 meshes, and that process is not the process of the patent in
suit.

X Q. 101. You mean by this do you that the drawing accompanying the patent 320,242 shows this regularity, is that what you mean?

A. Yes; but the regularity does not exist in expanded metal only on account of the crossing of the major and minor at right angles, for if they crossed at different angles the expanded metal would still have regularity.

X Q. 102. I must again ask you to confine your answers to the question which I ask you. The only regularity concerning which I have asked you is that consisting in the right angled relation of a major and minor axes of the meshes and the longitudinal and transverse lines through the intersections of the meshes?

A. That I did not understand.

X Q. 103. And the reason that you refer to the patent 320.242 as showing a process by which this regularity we are speaking of can be obtained is because this regularity is shown in the drawings accompanying that patent, is that correct?

A. No. I did not refer to that regularity at all. I meant the uniformity of the meshes. I examined the drawing in patent 381,230, Fig. 14, and that seems to me to show such regularity. I do not wish to be understood that I found such regularity as you refer to in the expanded metal itself nor did I examine any expanded metal in that respect.

X Q. 104. For what purposes is expanded metal commonly used in the arts?

A. Lathing; reinforcing concrete and cement work; and in cement sidewalks and gutters, where it is also embedded in the cement.

X Q. 105. Is it not also used for screening, window guards, fencing, and like uses?

A. I have heard of its use as fencing but as to the other
285 uses you have mentioned, but I cannot say I ever saw it used
that way.

X Q. 106. Do you know of its use in metallic clothes lockers?

A. Yes, I have heard of that.

X Q. 107. Of what material is it commonly used for making expanded metal for these uses?

A. I don't know but I should judge open hearth steel or Bessemer steel. I do not understand that the manufacturer is confined to any kind of metal, and all metals adapted for the purpose may be used. I should judge that iron or steel would be the cheapest and strongest.

X Q. 108. Do you know of any case where other materials than iron or steel have been used commercially for making expanded metal?

A. I am not positive, but I think I saw a brass screen in a counting house made of expanded metal.

X Q. 109. Is it not the fact that the wire drawing of a cold bar of steel or iron results in an increase of tensile strength, that is to say, that a wire drawn bar or rod has a greater tensile strength than a bar or rod of the same diameter or cross section that has not been wire drawn?

A. Yes.

X Q. 110. Have you made any tests or experiments with expanded metal produced by the process of the complainant's patent in suit to ascertain whether the stretched or elongated strands have a greater tensile strength than unstretched or elongated strands of the same cross section?

A. No, I have not.

Cross-examination closed.

Redirect examination by Mr. BINNEY:

R. D. Q. 111. In connection with Defendant's Exhibit Gunz Sample Broken and in connection with which you say you used one row of upper cutters and but one lower cutter, can you state
286 any more definitely than you have done what the general shape of the lower die or cutter was, particularly in respect to its supporting the metal from below on either side of the loops as they were formed in making the Ohl form of loop?

Objected to as incompetent.

A. The lower cutter as I now recollect has at the front a detachable plate between which and the body of the lower cutter the blade descended. This lower plate was used for making the three rows of Ohl loops which are all of the same width, namely a quarter of an inch. I made the first row which is less than a quarter of an inch wide without using this detachable front plate of the lower cutter, although it was still present.

R. D. Q. 112. This detachable portion of the lower cutter when the machine was used in the way described in the specification of the patent in suit, only needed to be removed when the width of the severed portions reached a quarter of an inch or when the depth of the meshes as carried down by successive rows made it necessary to afford space therefor. Is that correct?

A. Yes.

R. D. Q. 113. Similarly in the Ohl patent if a single row of half meshes are to be made at a time pursuant to the specification of the patent in suit, is it not a fact that a single one of the upper cutters *b* with a single one of the lower cutters or supports *h* would suffice, these being of course supported so as to operate exactly as they do in the Ohl patent, but the other cutters lying beyond the free face of such upper cutter *b* being merely omitted, and the housing and other supports being made to afford room for the expanded meshes if they do not already afford such room?

287 Objected to because there is no authority in the Ohl patent for the omission of the outer lower cutters and the consequent rendering of the outer face of the upper cutter inoperative and because such omission and the result thereof would be destructive of the purposes of the Ohl machine.

A. Yes, that is my understanding.

R. D. Q. 114. Would a single one of the upper cutters coacting with only a single one of the lower cutters in the Ohl patent provide means for exactly carrying out the process of the patent in suit?

A. They certainly would.

R. D. Q. 115. Is the molecular effect upon the metal of the strands or loops in the Ohl patent different either in kind or degree quantitatively, from the elongating and other so-called molecular effects mentioned in your cross-examination in connection with the process in suit?

A. It is not.

R. D. Q. 116. Is the process in suit as described in the specification of the patent in suit just as applicable to being performed by the mechanical functions of cutting teeth mounted on disks as by the mechanical functions of cutting teeth arranged in a row on a vertically reciprocating mounting. And if yes, is this exemplified in the Bradford patent 664,379 (apart from the possible mechanical defects in that Bradford machine)?

A. Yes.

Re-direct examination closed.
Deposition closed.

OSCAR F. GUNZ.

Defendant's counsel offers in evidence the Bradford patent above referred to and it is marked "Defendant's Exhibit Bradford Patent."

Adjourned to Monday, May 15th, 1905, 11 A. M.

288 United States Circuit Court, Northern District of Ohio, Eastern Division.

THE EXPANDED METAL COMPANY
vs.
THE GENERAL FIREPROOFING COMPANY.

Respondent's proofs continued before E. Van Zandt, notary public, as Special Examiner by consent, Tuesday, April 10, 1906, at the offices of Dickerson, Brown, Raegener & Binney, 141 Broadway, New York City.

Present: For Complainant, Ernest Howard Hunter, Esq. For Respondent, Harold Binney, Esq.

Deposition of William F. Kearns.

Q. 1. Please give your name, age, residence and occupation?

A. William F. Kearns, age 43; residence, Boston, Mass.; occupation, dealer in expanded metal, contractor for fireproofing and reinforced concrete construction.

Q. 2. What was your occupation in 1891?

A. I worked for the Northwestern Expanded Metal Co., of Chicago, Ill., as bookkeeper and having charge of their factory on Twenty-sixth street in Chicago.

Q. 3. How long were you with the Northwestern Expanded Metal Co.?

A. From early in 1891 until December, 1893?

Q. 4. What were the circumstances under which you left
289 the Northwestern Expanded Metal Co., and what was your
next occupation?

A. I left the Northwestern Expanded Metal Co. to go to work for the Eastern Expanded Metal Co., of Boston, Mass.

Q. 5. Were the Northwestern Expanded Metal Co. and the Eastern Expanded Metal Co. both licensees under several patents of Mr. Golding?

A. Yes, sir.

Q. 6. And was the Eastern Expanded Metal Co. organized for the purpose of operating under such license?

A. Yes, sir.

Q. 7. How long were you with the Eastern Expanded Metal Co.?

A. From December, 1893, or rather from the first of January, 1894, until December, 1905—about the middle of December, 1905.

Q. 8. In 1891 and 1892 what was the principal product of the Northwestern Expanded Metal Co.?

A. Expanded metal.

Q. 9. For what purpose was it used?

A. For fencing, window guards, trellises. Those were the principal uses. Some lathing was made.

Q. 10. In the next year, 1893, what development, if any, was there in the business?

A. We sold a very large amount of expanded metal in the form of lathing for plastering—holding plaster in buildings.

Q. 11. Was there any special cause that you can assign for the increased demand in lathing?

A. Yes, the large amount of new buildings; prominent hotels to take care of the visitors to the World's Fair, and in the construction of buildings and conduits and other work in building construction in the buildings of the World's Fair, and in the making of railings in the World's Fair buildings.

Q. 12. Were you familiar with what Chess Brothers or the
290 Central Expanded Metal Co. were doing in *in* 1891, 1892
and 1893?

A. Yes, to a quite large extent I was familiar with their operations.

It is admitted by complainant that Chess Brothers and the Central Expanded Metal Co. are one and the same concern.

Q. 13. Are you familiar with the following three ways of making expanded metal, termed by Mr. Golding, respectively, his first, second and third or present processes, the first consisting in slitting the metal sheet at the proper places and subsequently opening or expanding it; the second consisting in simultaneously cutting and expanding it by cutters arranged in step-like form, and the third, or patented process in suit, including simultaneously slitting and expanding in a manner to stretch and elongate the strands to permit the formation of each half mesh while the two ends of the half mesh are still secured to the uncut portions of the sheet?

A. I am familiar with the second and third, but not very much with the first process.

Q. 14. Do you know when and under what circumstances the lathing or expanded metal of the second process began to be used to reinforce concrete?

A. Yes, in the fall of 1893 in the United States. I don't know outside of the United States.

Q. 15. Please state the circumstances?

A. Some time in the summer of 1893, I believe it was Mr. Golding came to the factory; I believe he had been abroad; I made his acquaintance at the factory of the Northwestern Expanded Metal Company. After he had been there some time he commenced to make experiments with what we called heavy mesh expanded metal,
or more familiarly known as two and a half inch mesh, made
291 from No. 16 gauge steel by imbedding it in slabs of concrete
supported on a beam or arch made of concrete and members
of steel. He was successful in these experiments in building a floor that would support quite a large weight. After demonstrating successfully that expanded metal could be used in this way, through his efforts and Mr. W. W. Ramsey's efforts the Northwestern Expanded Metal Company took a contract to build the first floor of the Stock Exchange building on La Salle street, Chicago, using substantially the same method or system as Mr. Golding employed in his experiments in the factory of the Northwestern Expanded Metal Company. This, I believe, was the first expanded metal sold for purposes of

einforcement in concrete in the United States, although at the same me, or about the same time, Mr. Golding was negotiating for sev- ral other contracts, one of which was in St. Louis, another in Rock- ord, Ill., and another in Boston, Mass. All of those were secured.

Q. 16. Was the first great demand for expanded metal lathing, hich you said occurred in connection with the World's Fair build- ngs, prior to the first use of it and demand for it in floor construc- on for reinforcing concrete?

A. Yes; lathing came prior to it.

Q. 17. In what different metals did the Northwestern Expanded letal Company make expanded metal structures in 1891, such as eel, etc.

A. They made some little also in brass.

Q. 18. What size and character were the meshes of the brass aterial and what was the general finish and appearance of the rass material?

A. They had made before I came with them and I saw samples f one-half inch diamond mesh made of brass. It was very nicely ade material; very clean cut and looked as if it had been expanded evenly and perfectly in all directions. It looked well when
92 made up in railings for desks and railings in offices.

Q. 19. How did it compare in neatness and finish with the est diamond mesh at present made?

A. It compared very favorably; fully as good looking material as nything that is made to-day on the third process.

Q. 20. While you were with the Northwestern Expanded Metal ompany did you have any trouble with different grades of steel?

A. Yes, sir.

Q. 21. What was this trouble?

A. We found that if we did not get the steel very ductile and soft hen we were cutting and expanding it, that the strand on one side f the mesh would stretch and break; but if we got soft ductile steel e could stretch it and expand it successfully.

Q. 22. Are you still speaking of the second process and was this he only process used when you were with the Northwestern Ex- anded Metal Co.?

A. Yes, sir; that was the only one.

Q. 23. I have noticed that some metal made under the second rocess does not have diamond-shaped meshes, two sides being long nd two short. Can you tell me the reason for that if there is any eason?

A. That was made in that shape so that it could be used for lath- ng, as it would hold the mortar to put plaster on better than a ull diamond mesh made on that machine. In other words if the ull diamond mesh was made on that machine the opening would e too large to retain the plaster or mortar and by reducing the xpansion we were able to make a product that could be plastered n successfully.

Q. 24. Did the Northwestern Expanded Metal Co. also make diamond-shaped meshes where the four sides were of equal ength?

293 Yes, sir; both on that machine that made the lath and
what we called the two and a half inch mesh. We were n
able to make the one and a quarter inch mesh on the one and a qua
ter inch machine successfully. We could not make it successfully
we found that the strands in the stretching process would break wh
the material was drawn out to the full one and a quarter inch di
mond. We also had a great deal of difficulty with the two and
half inch mesh machine in 1891 due to the same cause, but th
trouble on the two and a half inch machine was finally overcome
getting the steel made soft and ductile enough to stand the stretc
ing. As there was not enough demand for the one and a quart
inch diamond mesh to pay for all the trouble and bother in gettin
the steel right, we used to buy this form of material from the Ce
tral Expanded Metal Co. and gave up manufacturing it entirely
our own shop.

Q. 25. Did the Central Expanded Metal Co. roll their own ste
from the slabs or did they purchase it?

A. At that time they rolled most of their own plates that we
suitable for one and a quarter inch mesh and two and a half in
mesh.

Q. 26. How did the difference as between expanding to the fu
diamond shape and expanding to these elongated shaped mesh
affect the stretching or breaking of the metal?

A. There was very little breaking of the strands on the elongat
meshes. If, however, the knives were not properly adjusted a
the steel just right, we used to have some trouble even on that b
nothing like as much as on the full diamond-shaped meshes.

Q. 27. Does the stretch come unevenly at one side of the mesh,
evenly throughout the whole strands on both sides of the mesh?

A. My observation led me to believe that the stretch ca
294 almost entirely on one side or one strand.

Q. 28. I have noticed in the machines which Mr. Goldi
has testified he used in the second process, the stroke of the upp
cutters is perpendicular to the sheet, whereas the strand formed
such perpendicular stroke is a diagonal strand formed from a co
siderably shorter piece of the unstretched metal. Are you able
say what the stretch of the metal is in forming these stretch
strands?

A. Well, having watched the machines a great many times
operation, to the best of my belief and judgment the stretch w
about 15 to 20 per cent., that is, when it was opened out to the fu
diamond.

Q. 29. And when you had trouble with the breaking of the mesh
in stretching to the full diamond, did these breaks usually occur
the same sides of all the strands?

A. Generally on the same side unless we got a particularly ha
lot of steel and then it would break on both sides.

Q. 30. In the efforts to get properly ductile steel, did you and M
Golding ever have any discussion concerning the qualities of steel?

A. Mr. Golding used to take part in the conversation carried
by Mr. Ramsey, manager of the company, and Mr. Seidel, the fo
man of the company.

— 31. Do you remember any suggestions that Mr. Golding made with the object of reducing the breaking of the metal in 1893?

A. He worked on one of the machines there for quite a long while with Mr. Seidel trying to get it to work better so there would be less breakage and I know he was consulting with Mr. Seidel quite frequently about the best way to make the steel and the adjustment of the machines and the adjustment of the feed, and he was able to give Mr. Seidel quite a little valuable information from what 295 he had learned on the other side in England, where he had been for a number of years with the Expended Metal Company.

Q. 32. Do you know what adjustments of the machine were made to counteract the breaking of the metal by Mr. Golding?

A. Principally in the feed arrangement and the dogs for holding the sheet in position.

Q. 33. Up to what gauge of metal and what size of mesh were Chess Brothers in 1891 making the full diamond mesh?

A. They were making four inch mesh from No. 16 gauge steel plates full diamond mesh, and they were also making full diamond one and a quarter inch mesh from No. 18 gauge.

Q. 34. Which of the several companies were the first who used the third or patented process for making diamond mesh, to your knowledge?

A. The Northwestern Expanded Metal Co. were the first in this country that I know of that used that process.

Q. 35. Has or has not the Northwestern Company since 1893 continued to use the second process for making expanded metal for reinforcing concrete?

A. They have continued using the second process for making material for that purpose and used for that purpose.

Q. 36. Are you also informed whether they make large size mesh under the third process or patent in suit for reinforcing concrete?

A. The best of my knowledge is that they are still using the second process for making all the heavy mesh for the reinforcement of concrete on machines covered by the second process.

Answer objected to unless the witness can show that he has some source of information to qualify him in making this answer.

296 Q. 37. Have you personal knowledge of the fact stated in your last answer, and if yes, when did you last get such personal knowledge?

A. The last personal knowledge that I had was about two years ago when I was at their factory. Since that time I have received letters from the president and manager of the Northwestern Company asking for advice as to what kind of a machine to build and what size. That was as late as last fall.

Q. 38. What has been your occupation and experience from 1893 while with the Eastern Expanded Metal Co. in respect to the construction of the machines and the operation of the machines in making the expanded metal structures?

A. I had a great deal to do about instructing the superintendent or foreman in the shop how to make the material in expanded metal lath and would visit the factory frequently and consult with him and tell him how I wanted the material made, and a number of times showed them how I wanted it and explained to him and had him set the feed arrangement and knives to produce more or less expansion and wider or thinner strands. When the first machines were installed I assisted quite a great deal in getting the machines in working order and shape. I have had practically the entire charge of the business except the financial end of it in Boston or New England from 1893 up to last year. I am familiar with all the details of the business both selling and manufacturing and contracting. I was General Manager of the Eastern Expanded Metal Co.

Q. 39. Up to what weight of metal and size of mesh does the Eastern Expanded Metal Co. utilize the third process?

A. The heaviest cut we made was what we called half inch mesh made from No. 18 gauge steel, although we cut some No. 16 gauge steel—not very much of that weight. Most of the product of
297 those machines was made from No. 24 gauge.

Q. 40. Does the Eastern Expanded Metal Co. also use the second process still?

A. Yes, sir, they do.

Q. 41. The third process machine is readily adjustable, is it not, to the width of strand which you desire to cut?

A. Within certain limits, yes.

Q. 42. Was the machine of the second process so adjustable?

A. No, there was only one strand to be made from it without dismantling it and building it partly over.

Q. 43. Is this mechanical advantage due to the difference in machines an important advantage?

A. It is.

Q. 44. Is it an advantage or a disadvantage that the third process necessarily stretches the strands?

A. For the reinforcement of concrete I should say it was a disadvantage.

Q. 45. Will you give some of your reasons for that statement and state what if any steps have to be taken to avoid the disadvantageous effects of the stretching?

A. When the material is made by the third process in the heavy forms used in reinforcing concrete as it comes from the machine the sheet of expanded metal is distorted and is inclined to curl or bulge, and the strands are of course drawn and stretched and are very brittle and hard, and it is not suitable for this kind of work in the form that it comes from the machine and therefore it has been found necessary to bring it back to its original form as near as possible by the process of annealing over a fire. This takes the stretch out of the material and allows it to become flattened and even, so that it is readily adaptable to be laid in the desired form in the concrete in which it is imbedded. The severe stretching it gets in the
298 machine in my opinion makes it very undesirable and in fact dangerous to use in the concrete unless it has been put through this annealing process.

Q. 46. With brass or other more ductile metals would this same objection exist or be so great if it did exist?

A. It depends entirely on the nature of the work or construction in which it is going to be placed. In reinforcing concrete it is put in to furnish all of the tensile strength that is required for the construction and all the stability of the structure depends almost on its having the highest possible tensile strength. In my opinion the stretching takes a great deal of the elasticity of the material out of it, and it has not got to be strained very much further before it will break under pressure or under test, though on the point of brass and other ductile materials it depends entirely on whether it is going to be used in the same way. If they were to be used for the same purpose I should say it was a decided disadvantage unless they could be annealed and brought back to the original form as near as possible.

Q. 47. In your contracting work would you use any expanded metal made by the machine that so stretches the strands without first having annealed the metal?

A. I would not care to.

Q. 48. Do you have any trouble with architects and engineers on account of the stretching?

A. We very often had criticisms made by prominent engineers about the process of manufacturing the material, but those criticisms were mostly against the stretching or distortion of the steel and we met those criticisms and objections by telling them that we re-annealed the steel after expansion and brought it back to its original form, and that explanation was generally satisfactory to
299 them; but on the other hand they would not care to accept the material unless it was re-annealed. When I say "re-annealed" I mean the last annealing. It is annealed before it is expanded and it is annealed again after it is expanded.

Q. 49. Do you mean that you anneal it before expanding it?

A. No; but the mill from whom we buy the plates is required by our specifications to anneal the sheets before they are sent to us to soften them.

Q. 50. Was it your desire in each case to restore the metal as nearly as possible to its original condition or not?

A. It was.

Q. 51. To what extent have you had trouble with breaking of the material in handling it before it has been again annealed?

A. Not very much because we discovered that tendency very early and as we did not manufacture the material ourselves we instructed the Central Expanded Metal Co. who made it for us that all of our sheets must be annealed after they had been expanded in the manufacture. But we discovered in the making of tests in the Massachusetts Institute of Technology seven or eight years ago that the unannealed samples were very irregular in the testing machines. They would break at altogether different strains and stresses than they were supposed to break at and would run anywhere from 30,000 to 50,000 pounds to the square inch, whereas the annealed samples would run uniformly from 55,000 to 60,000 pounds per square inch.

Q. 52. In your last answer you spoke of expanded metal from Chess Brothers or the Central Expanded Metal Co. What size meshes did your company get from Chess Brothers which your company did not itself manufacture?

A. We got three-quarter inch mesh; one and a half inch
300 mesh; two inch mesh; three inch mesh, and six inch mesh.

Q. 53. Did you have all these tested at the Massachusetts Institute of Technology?

A. No; the three inch mesh and six inch mesh were the kinds we had tested as they were the kinds usually used in reinforcing concrete. The other meshes were used for different purposes and it did not matter very much whether they had a high tensile strength or not and it was very important that the three inch mesh and the six inch mesh should run uniformly.

Q. 54. In February, 1904, the day of the commencement of this suit, were you in a position to know what companies were making and where you could procure the larger sizes of mesh under the cutting and stretching process in suit?

A. Yes, sir.

Q. 55. Who were making that and where was it procurable in this country?

A. The Central Expanded Metal Co. were the only ones making it at that time in the United States.

Q. 56. And at that time was or was not the Northwestern Expanded Metal Co. making the large size mesh by the second process?

A. They were making it.

Q. 57. Now assuming that Mr. Golding has indicated his belief that the success of the business of making expanded metal was due mainly to his alleged invention of the third process and the use of the product in reinforcing concrete, is there in your opinion any foundation for such a belief?

Objected to as incompetent, irrelevant and immaterial.

A. No; I believe the business would be a success if he had never invented or patented the third process.

301 Q. 58. And were you in a position to know whether the business was a success under the second process in suit?

A. I know that the Eastern Expanded Metal Co. were uniformly successful from the day they commenced business and could have continued successful with only the old patents to work on.

Q. 59. Referring particularly to the large sizes such as you have said the Northwestern Expanded Metal Co. made under the second process, was not that successfully used for reinforcing concrete?

A. Yes, sir.

Q. 60. Now, in view of your extensive experience both in the use of the various materials and in connection with the two types of machines, is it your opinion that the value of the third alleged process and machine as compared with the second is due to the adjustability of the machine to different thicknesses of meshes and for making different sizes of meshes, or on the other hand due to the difference in the alleged character of the expanded metal produced?

Objected to as incompetent, irrelevant and immaterial, and the question is also leading in manifestly suggesting to the witness the particular answer desired and the imparting that answer in the language of counsel.

A. The advantage of the third process is in the adjustability of the machine so that it can cut different messages and different thicknesses of steel, and the possibility of making uniform strands so that one strand is just as strong as the other.

Q. 61. Are you also familiar with what the Western Expanded Metal Co. and the Southern Expanded Metal Co. have produced in the way of expanded metal?

302 A. Through information given me, and correspondence, and by personal conversation with the president of the Western Expanded Metal Co. I know that they are still making expanded metal for the reinforcement of concrete under the second process. The Southern Expanded Metal Co. never operated as a manufacturing company although having a license giving them permission to do so.

Answer objected to as incompetent and hearsay.

Q. 62. Have you any knowledge whether the Southern Expanded Metal Co. has a plant for the manufacture of expanded metal?

A. I know they have not.

Q. 63. Have you knowledge about the Western Expanded Metal Co?

A. Only through the president of the company, Mr. Backus. Through him I learned that they have a plant for manufacturing expanded metal under the second process.

Answer objected to as incompetent and hearsay.

Q. 64. Assuming that Mr. Golding has testified to the cities of the United States where expanded metal is made under the third process he has named only Pittsburgh, Boston and Chicago in the United States. Does this correspond with what you have learned in your investigation?

A. Those are the only places that I know of where the expanded metal made under the license of Mr. Golding under the third process is made. These are the only three cities.

303 Q. 65. Assuming that Mr. Golding has testified that the third process as a process and independently of any machine, enables the manufacturer to make a more regular and perfect mesh, please state what is your opinion as to whether such alleged greater regularity is due to the construction and rigidity of the machine employed or to the so-called process?

Objected to as incompetent, irrelevant and immaterial.

A. My opinion is that it is entirely due to the machine and not to the process.

Q. 66. What other metal reinforcements for concrete are used in competition with this expanded metal?

A. There is wire, welded wire and woven wire; plain bars either round or square; square bars twisted, corrugated bars, Thacher bars, and Golding bars.

Q. 67. Please state what development there has been in the last ten or fifteen years in the use of fireproof materials in general in building construction?

A. There has been a very large increase dating from about 1893. In the use of expanded metal alone the use has grown from nothing up to sales by the different expanded metal companies aggregating nearly twenty million feet of the different meshes used in reinforcement, and there has been a relatively large increase in the sale of wire products and wire meshes for the same purpose. Also in the sale of the different forms of what we call deformed or twisted bars such as corrugated bar, Thacher bar, and others. Also there has been a tremendous and very large tonnage in reinforcing concrete in the form of round bars or rods from sizes of one-quarter inch up to one and a half inches and the manufacture of cement. When we started business (the Eastern Expanded Metal Co.) in 1894 there were practically only two small mills engaged in the manufacture of Portland cement in the United States. To-day there are over fifty, and the consumption has grown from a few thousand barrels of Portland cement made in the United States until to-day
304 the manufacture of American Portland cement must aggregate between thirty and forty million barrels annually. Not all of that, however, going into the fireproof construction, but I should say easily one-third of that amount has gone into fireproof construction alone. That is about the history of the business.

Q. 68. You have spoken of concrete reinforcement, and in your last answer you have spoken of cement and the increased quantity of cement used in recent years. What is the connection between cement and concrete?

A. Cement is used to make concrete by mixing it with sand and stone or gravel or cinders or slag. Some such materials as those mentioned.

Q. 69. What influence has this tremendous increase in fireproof construction and in the use of concrete in particular had upon the expanded metal industry.

A. It has enlarged the field and increased the demand for expanded metal and similar products to a very great extent.

Q. 70. With the development of fireproof construction and concrete work to which you have testified, what was the attendant development in the use of fireproof partitions and other structures requiring metallic lathing.

A. There was a very large increase in the demand and consequently in the sale of metal lathing.

Q. 71. Of the entire amount of fireproof construction what proportion do the expanded metal structures enter into it?

Objected to as incompetent unless the witness can show that he possesses such information as statistics that make him qualified to answer.

A. Expanded metal is, I should say, the second largest in impor-

tance in the fireproofing industry in the United States, terra-
305 cotta being the first, expanded metal second, and wire fabrics
third.

Q. 72. You have testified about the use of expanded metal for lathing and reinforcing concrete and also for miscellaneous uses, such as fencing, screens, etc. Please state how important these other uses than for lathing and concrete, are?

A. A very small percentage. Expanded metal for other uses such as you describe is a very small percentage of the total amount of expanded metal manufactured. I should say it is not more than three per cent. at the outside of the total amount manufactured.

Q. 73. Why is that?

A. The material expanded metal is not as suitable for such uses as wire, woven wire fabrics are very much better. They can be worked more economically and are in every way better adapted for such purposes with probably one exception and that would be in the manufacture of clothes lockers, and in that particular instance expanded metal is more adaptable and better than the wire, but for window guards, fencing, railings, trellises, etc., wire is better and in every way more adaptable for such uses.

Q. 74. Can you give the proportion of expanded metal in square feet or yards used for lathing as compared with that used for reinforcing concrete?

A. I can on the output of the Eastern Expanded Metal Co. I have no absolutely reliable figures on any of the operations of the other companies. Figures for 1904, which were the last I had, showed that the Eastern Expanded Metal Co. manufactured nearly 800,000 yards of expanded metal for use as lathing and they bought from the Central Expanded Metal Co. during that year and used in their contracting business and sale to customers, nearly 2,500,000 or better, 2,300,000 square feet of the different meshes such as three
inch mesh and six inch mesh; so that reduced to feet they
306 sold or used in their work about 7,200,000 square feet for
lathing and 2,300,000 feet of the heavy meshes for the reinforcement of concrete.

Q. 75. How much material for fencing and other miscellaneous uses outside of lathing and concrete did your company sell in that year, if any?

A. For fences, window guards, etc., we used at the outside and sold not more than 10,000 square feet. For clothes lockers we used and sold not more than 30,000 feet. This was all.

Q. 76. During all the increase in the use of fireproof construction and in the use of concrete reinforcement, as you have testified, to what extent has the market for and the use of expanded metal under the second Golding process increased?

A. That has increased with the Eastern Expanded Metal Co. to quite an extent but not so much as it might have done if we had pushed the sale of it, as we preferred to push the sale of the material manufactured under the third process for the reason that we could vary the weight of it and give a more uniform product because the machine worked much better and were able to vary the product without increasing the expense; but in spite of the fact that we did not push the sale of that material, the sale still increased and there is to-day a much larger demand for that kind of material than has been heretofore.

Q. 77. When you wanted to change the thickness of the strands in the machines of the second process, what was necessary to do?

A. In the second process we could not change the width of the strand without taking the machine apart.

Q. 78. Did you use the same cutters, or did you have to make special cutters for each thickness?

A. We could only use one form of cutter. We never attempted to vary the strand on the second process at all except by rebuilding the machine. We rebuilt one machine to vary the thickness 307 in the width of the strand, but we could cut different gauges or thicknesses of sheets on the same machine by varying the feed. But in the third process we could vary the thickness of the steel and the width of the strand by a very slight adjustment of the feed.

Q. 79. What adjustment of the third machine do you have reference to for changing the width of the strands?

A. The adjustment of what we call the feed, which clutches the steel sheet and pushes it out so as to engage it between the upper and lower knives of the machine. By adjusting that so it would move an eighth of an inch or three-thirty-seconds or one-sixteenth of an inch we would obtain a wider or narrower strand as desired.

Direct examination closed.

Cross-examination by Mr. HUNTER:

X Q. 80. You have stated that you are a dealer in expanded metal and a contractor for reinforced concrete construction. What make of expanded metal are you using in your business at present?

A. We are using several kinds.

X Q. 81. What makes are they?

A. Using some made by the Eastern Expanded Metal Co. Some I am informed that is made by the United States Steel Corporation or the American Sheet & Tin Plate Co. I am not sure which, and some that is made by the General Fireproofing Company of Youngstown, Ohio.

X Q. 82. Is it not a fact that you have some sort of an agency arrangement with the General Fireproofing Company?

A. It is a fact.

X Q. 83. You are acting as their agent?

308 A. I buy their material and sell it and use it in my construction work.

X Q. 84. Under some contract or arrangement with them?

A. Simply a verbal arrangement.

X. Q. 85. Does your agreement give you the rights for any particular territory?

A. For the New England States.

X Q. 86. Are you paid any salary by that company?

A. No, sir.

X Q. 87. Is your agency an exclusive one for the North Eastern ates?

A. In a way, yes, not altogether.

X Q. 88. Are you obtaining from the defendant both the large zez of expanded metal such as are used for concrete reinforcement id the smaller sizes such as are used for metallic lathing?

A. I obtain from them the larger meshes used for concrete reforcement and some of their lathing called herringbone lathing.

X Q. 89. When did you enter into this arrangement with the Genal Fireproofing Co.?

A. Some time about the first of this year.

X Q. 90. It was practically immediately after you severed your nnection with the Eastern Expanded Metal Co., was it not?

A. Yes, sir.

X Q. 91. How did you come to sever your connection with the astern Expanded Metal Co.?

A. Because I got tired of working for them.

X Q. 92. Was it entirely voluntary on your part?

A. I think so.

X Q. 93. And before making this arrangement with the defendnt in January of this year, you had been connected with the Exanded Metal Companies operating under the Golding patents for a period of approximately fourteen years, had you not?

09 A. Yes, sir.

X Q. 94. How does the expanded metal of the defendant's anufacture which you are using differ from the expanded metal of xhibit No. 7?

A. You mean in appearance?

X Q. 95. I mean in any respect whatever.

A. Well to the eye it looks the same.

X Q. 96. Can you point out any difference?

A. Have you any of the other?

Complainant's counsel asks defendant's counsel if they will prouce a piece of defendant's metal similar to that which the witness ys he is selling, as the original exhibits are not here.

Respondent's counsel has not any such exhibit here.

X Q. 97. In view of the fact that defendants are not able to prouce a piece of their metal I will ask you to make the comparison beween the metal which you are at the present time engaged in selling nd with which you undoubtedly are familiar.

A. I cannot make any comparisons unless I have both kinds side y side.

X Q. 98. You cannot point out any differences?

A. I say I cannot, because I cannot see the two side by side. I ever saw them side by side.

X Q. 99. Do you know of any differences between the two?

A. I don't know of any on this particular material. I did on the naller mesh—the diamond mesh lath.

X Q. 100. While you were connected with the Northwestern Expanded Metal Co. prior to January, 1894, did you have anything to do with the practical operation of the machines?

A. I never ran one, no.

310 X. Q. 101. What did you have to do with the actual operation of the plant and the manufacture of expanded metal at that time?

A. I kept the time of the men; did some hiring and discharging; gave the foremen their instructions what kind of material to make; how much to make of it; looked over the orders; did the billing; did a great deal of correspondence and talked with the foremen who had charge of the machines; offered suggestions how to run them; talked with them about the manufacture and softness and hardness of the steel; talked with them about the steel plates and sheets; looked after the buying of certain articles connected with the manufacture and operations; in fact, had general charge of the details of it.

X Q. 102. But you had nothing to do with the actual running of the machines, did you?

A. Nothing more than what I told you.

X. Q. 103. I believe you have suggested that there was a sudden increase in the production of expanded metal for lathing purposes at about the time of the World's Fair in Chicago due to the activity in building operations. Did not this large production of expanded metal for lathing purposes continue after that time?

A. It had a falling off the following year.

X Q. 104. And subsequently to that?

A. It commenced to increase again.

X Q. 105. Of course these remarks apply particularly to the Northwestern Expanded Metal Co. at Chicago?

A. Yes.

X Q. 106. Up to the time you left the Northwestern Expanded Metal Co., about January 1, 1894, what was its general financial condition? Was it a paying concern?

A. The year 1893, when I left the company, the books showed that the company had made quite a handsome profit during that year.

311 X Q. 107. Prior to that time?

A. Prior to that time. For the two years previous that I was connected with the company, they had not showed any profit.

X Q. 108. You have referred to some pieces of expanded metal made in brass. You did not see any of them made?

A. No, sir.

X Q. 109. How much of the material did you see?

A. My recollection is that I saw one sample piece, not a very large piece, probably a foot square, that was unframed and another piece that was framed into a railing that was around my desk. That also was a small piece.

X Q. 110. How large did you say those pieces were?

A. I don't remember, but I thought it was a foot square. That piece around the desk was quite a small piece. It was framed in around the cash booth and it was not a foot square. The other piece may have been a foot square though I cannot recall how large it was.

X Q. 111. And that is all that you saw of this expanded metal made out of brass?

A. Yes, sir.

X Q. 112. What were these two little pieces of brass metal used for? What were they doing in the office?

A. I told you. One piece was in this railing—part of the railing. The rest of the railing was made of larger mesh and expanded metal.

X Q. 113. You have, I believe, referred to a difficulty experienced in producing expanded metal under the second process because of the breaking of the strands. Do I understand you correctly that this occurred only when the metal was too hard?

A. I did not intend to say that if I did.

X Q. 114. Under what circumstances did you observe that this breaking took place?

312 A. I watched it coming out of the machine and going into the machine and saw the strands breaking when the pressure of the knives drew the strands downward. Sometimes we would get a good sheet with only a few strands broken; other times nearly every mesh would be broken.

X Q. 115. Did it happen frequently?

A. That particular kind that I refer to—the one and a quarter-inch mesh—expanded to the full diamond. It broke so often the strands that we had to abandon the manufacture of that particular style altogether.

X Q. 116. What caused the breaking of the strands?

A. My observations in watching the machine led me to believe that it was the stretching of the strands of the metal.

X Q. 117. That was your conclusion from watching the operation of the machine. Did you ever make any actual measurements to determine whether there was any stretching?

A. No, I don't know that I did.

X Q. 118. The sheet was always shorter in length than the original blank, was it not?

A. No, sir.

X Q. 119. Do I understand you to say that by the second process you produced expanded sheets that were not shorter than the original blank?

A. No, I don't mean to say that.

X Q. 120. Then it is a fact that in all of these sheets made by this second process the expanded product is shorter than the original blank from which the expanded sheet was formed?

A. It depends on what material you are talking about.

X Q. 121. I am talking about any material you saw used?

A. The two and a half inch mesh and the one and a
313 quarter inch mesh expanded or stretched out to the full
diamond mesh were shorter than the steel plate from which
they were made.

X Q. 122. Do you know how much shorter they were?

A. No; I don't know exactly.

X Q. 123. Was not this also true of the metal lathing of the smaller meshes?

A. Well I don't know; the lathing came out in such a skewed fashion that it was hard to tell whether it was shorter or longer. We had to trim off the ends of the sheets, and the pieces trimmed off on both ends were triangles.

X Q. 124. Have you seen much metal made by the third process, or the process of the patent in suit?

A. Yes.

X Q. 125. Have you observed any breaking of strands in the production of the metal under that process?

A. I have seen some.

X Q. 126. Frequently?

A. No.

X Q. 127. Where did you see such breaking of strands?

A. In the factory of the Eastern Expanded Metal Co.

X Q. 128. Have you ever seen any metal similar to that which you are now engaged in selling produced at the defendant's factory?

A. No, sir.

X Q. 129. Have you ever seen any of defendant's metal manufactured?

A. No, sir.

X Q. 130. You say you are in your present business purchasing expanded metal from the Eastern Expanded Metal Co.?

314 A. No, sir, I did not say that. I said I was using some that had been purchased from the Eastern Expanded Metal Co. That is what I intended to say. In other words I did not buy the expanded metal myself.

X Q. 131. And the only expanded metal which you purchased is that manufactured by the defendant?

A. I am buying a very large amount of expanded metal lathing from another concern in Boston.

X Q. 132. And that is only for metallic lathing?

A. Metallic lathing, yes, sir.

X Q. 133. The only expanded metal that you purchase for concrete reinforcement, is that manufactured by the defendant?

A. That is right; yes sir.

X Q. 134. Is this metal you purchased from the defendant annealed?

A. Yes, sir. I presume it is. I have no personal knowledge that it is, but I instructed them to anneal it, and it looks as if it had been annealed. If it was not, I believe I would recognize it.

X Q. 135. Did I correctly understand you to say that some time ago you were consulted by the Northwestern Expanded Metal Co., or some one connected with that company, as to the kind of machine they should build for making expanded metal?

A. Yes, sir.

X Q. 136. Well, who was it consulted you?

A. General Wheeler, the president of the company.

X Q. 137. And when?

A. During 1905.

X Q. 138. How did he come to consult you?

A. He asked my opinion as to which was the advisable machine to build—whether an eight foot, ten foot, twelve foot or sixteen foot.

X Q. 139. Did he consult you with reference to whether it was to be a machine to operate under the second process or under
315 the third or new process?

A. Under the third process.

X Q. 140. The intent was that it was to be a machine to operate under the third process?

A. I so understood him.

X Q. 141. I understand that the Eastern Expanded Metal Co. during the time of your connection with it did not have in operation any machines for making the metal of large meshes for reinforced concrete work. Is that correct?

A. No, sir, they did not have.

X Q. 142. They purchased all such materials from the Central Expanded Metal Co.?

A. Yes, sir.

X Q. 143. Now about what quantity did they purchase during your connection?

A. The figures I had during 1904 were approximately 2,300,000 square feet of those heavy meshes.

X Q. 144. What proportion of that was metal made by the second process, and what proportion made by the third process?

A. All by the third process.

X Q. 145. The Central Expanded Metal Co. have machines and at that time had machines for making the large size metal by the second process, did they not?

A. I believe they had. I don't know anything about it personally.

X Q. 146. Do you know whether the Eastern Expanded Metal Co. bought any of the large size material made by the second process from the Central Expanded Metal Co. during the time you were connected with it?

A. They did.

X Q. 147. Prior to 1897 what proportion of the large size
316 metal purchased by the Eastern Expanded Metal Co. from the Central Expanded Metal Co. was made under the second process?

A. I cannot answer that; I don't know.

X Q. 148. Was it a large portion or a small portion?

A. I don't know; I don't remember.

X Q. 149. Now after 1897 what proportion of the large size metal purchased from the Central Expanded Metal Co. was made under the second process?

A. How soon after?

X Q. 150. From 1897 down?

A. Around 1897 or 1898 we bought a large quantity of the old second process. Since then they have been buying mostly the third process.

X Q. 151. It is a fact, is it not, that these machines, particularly those for making the large size mesh, are very expensive?

A. They do not cost any more than the others as I remember them.

X Q. 152. Which others?

A. The second process.

X Q. 153. I refer to machines for making this metal irrespective of whether they are machines for making it under the second or third process. As machines, they are very expensive, are they not?

Objected to as irrelevant, misleading, and not asking for the facts but conclusions as to what is very expensive. with no standard of comparison.

A. I don't know what you mean by expensive or very expensive. I have seen machines that cost twenty times as much for making very small articles.

X Q. 154. Do you know how much a machine for making large sizes of expanded metal under the third process cost?

A. No, sir.

317 X Q. 155. Will you please explain a little more fully what you understand to be the object of annealing the expanded metal made according to the third process?

A. To first take out the *the* brittleness and hardness and give it more elasticity and make it more pliable to conform to the position it has to assume in the concrete, and to straighten out and flatten the sheet from the distorted appearance it has when it comes from the machine.

X Q. 156. Where have you seen expanded metal under process of manufacture by the third process? I am referring now to the large sizes of expanded metal which are used for concrete reinforcement.

A. At the works of the Central Expanded Metal Company at Pittsburgh, Pa.

X Q. 157. Did you observe that those sheets were distorted in appearance?

A. Yes, I observed that they did not lay flat on the floor when they were laid down.

X Q. 158. How many such sheets did you see?

A. I cannot remember the number—quite a large quantity.

X Q. 159. Do you mean by that, several hundred?

A. Yes.

X Q. 160. To what is this hardness and brittleness due which renders the annealing necessary or advisable?

A. I presume it is the stretching process which it undergoes in the manufacture; passing through the expanded metal machine.

X Q. 161. Did you ever have the sheets which were made by the second process annealed after they were expanded?

A. No, sir, I did not.

X Q. 162. Did you hear of any one doing it?

A. I don't think I have.

X Q. 163. Why did you not anneal those sheets?

A. If I knew as much about it then as I do now about the
318 requirements of reinforcing concrete I should have insisted on that product being annealed also.

X Q. 164. When did you have these tests made with expanded metal of large size made by the Central Expanded Metal Company at the Massachusetts Institute of Technology?

A. Somewhere between 1898 and 1900. Somewhere in that vicinity; I don't recollect.

X Q. 165. Was it the result of these tests which made you decide to have the sheets annealed?

A. I don't remember now; I believe Mr. Morse, who was then vice-president of the Eastern Expanded Metal, was responsible largely for the tests, and to some extent the annealing process. He was an engineer, a graduate of the Massachusetts Institute of Technology, and was more familiar with questions of that kind than I was then.

X Q. 166. But after that time you had the sheets annealed?

A. They all came annealed to me. I would like to qualify that. There is a great deal of the expanded metal, of course, that I never saw that we bought, and I could not say of my own personal knowledge that all of it was annealed.

X Q. 167. But so far as your knowledge goes it was your effort to have it annealed?

A. I wanted it annealed.

X Q. 168. Did the Eastern Expanded Metal Co. continue to buy any large sized expanded metal made by the second process from Chess Brothers after 1900 and use it in concrete reinforcement or sell it for that purpose?

A. I don't remember whether they did or not. They may have bought some.

X Q. 169. Don't you know whether you used any after 1900?

A. I am not sure on that point. We may have used some.

319 X Q. 170. You were in charge of the construction, were you not?

A. Yes.

X Q. 171. And you have no recollection of seeing any of the large size material made by the second process used in the work of the Eastern Expanded Metal Co. after the year 1900?

A. I don't remember seeing it.

Cross-examination closed.

Deposition closed.

(Signature waived.)

Adjourned subject to agreement between counsel.

United States Circuit Court, Northern District of Ohio, Eastern Division. In Equity.

THE EXPANDED METAL COMPANY
vs.
GENERAL FIREPROOFING COMPANY.

Certificate.

STATE AND COUNTY OF NEW YORK, *ss:*

I, E. Van Zandt, Special Examiner by consent of counsel in the above-entitled cause, hereby certify that the foregoing witnesses, Oscar F. Gunz and William F. Kearns, were by me first duly sworn to testify the truth, the whole truth, and nothing but the truth; that the deposition of Oscar F. Gunz was taken by me directly on 320 the typewriter and that the same was read over by Mr. Gunz before he signed the same in my presence; that the deposition of Mr. William F. Kearns was taken down by me in shorthand and afterwards transcribed by me; that Mr. Kearns' deposition was read over by him but that his signature to the same was waived owing to the fact that the witness resides at a considerable distance from New York; that the aforesaid depositions were taken pursuant to notice and agreement between counsel at the offices of Dickerson, Brown, Raegener & Binney, 141 Broadway, New York, commencing at 11 A. M. on Monday, April 17, 1905, and continuing at various times to and including April 10, 1906; that the complainant was represented by Ernest Howard Hunter, Esq., and the defendant by Harold Binney, Esq. That the several exhibits therein cited were offered in evidence and were marked as therein noted, and that I am not of counsel or related by blood or marriage to either party or otherwise interested in the event of this suit.

In witness whereof, I have hereunto set my hand and seal this 12th day of May, 1906.

[SEAL.] E. VAN ZANDT,
Notary Public, New York Co., N. Y.

321 In the Circuit Court of the United States, Northern District of Ohio, Eastern Division. In Equity. Patent No. 527,242.

EXPANDED METAL COMPANY
vs.
GENERAL FIREPROOFING COMPANY.

PITTSBURG, PA., *April 26th*, 1906.

Testimony taken in behalf of the defendant, pursuant to agreement of counsel, at the offices of Julian Kennedy, Bessemer Building, Pittsburg, Pa., April 26th, 1906, beginning at 11 A. M., before George B. Bleming, Notary Public and Special Examiner.

Present: Ernest Howard Hunter, Esq., Counsel for Complainants; Messrs. Bakewell & Byrnes, Counsel for Defendant.

Testimony of Julian Kennedy.

JULIAN KENNEDY, a witness produced by the defendant, being first duly sworn, testifies as follows in answer to questions put to him by defendant's counsel:

Q. 1. State your name, age, residence and occupation?

A. Julian Kennedy; age fifty-four years; residence, Pittsburgh, Pa., occupation, mechanical engineer.

Q. 2. What experience have you had relating to the art of metal working, and what scientific training and education have you had which would qualify you to *to* testify as an expert in a case relating to the manufacture of expanded metal? 322

A. I graduated from the Sheffield Scientific School at Yale College in 1875; after which I was one year superintendent of the works of the Brier Hill Iron Company, Youngstown, Ohio, one year as superintendent of the Morse Bridge Company, at the same place; afterwards for four years superintendent of the blast furnaces at the Edgar Thomson Steel Works; two years superintendent of the Lucy Furnaces at Pittsburg; three years as general superintendent of the works of Carnegie-Phipps & Company, with headquarters at their Homestead works; and for two years engaged in the construction of the Latrobe Steel Works, whose chief engineer I have been for over fifteen years; and for the last fourteen years I have also been engaged in business as a consulting and mechanical engineer, and have constructed a large number of plants, including blast furnaces, steel works, and mills for rolling rails, structural material, wire rods, sheets, plates and tubes. I have had a large experience and am very familiar with the action of shears for cutting steel plates and sheets; also of machinery for punching, drawing and forming plates and sheets cold, as well as hot; and am also familiar with wire drawing and cold drawing of tubing, and similar work, this experience beginning with my work in the Homestead mill and continuing through my engineering practice ever since.

Q. 3. Have you read and do you understand the patent in suit?

A. Yes; I have read this patent, and think I understand it.

Q. 4. Will you please explain the means by which expanded metal according to the patent in suit is made?

A. The means by which expanded metal is made by the patent in suit consist of a straight under knife of a shear, together 323 with an upper knife of the same shear having a corrugated edge, each corrugation being of the size of one half of one reticulation or opening to be formed in the metal in the process of expanding it. The plate to be operated upon is placed in the machine with its edge projecting a short distance over the lower knife and the upper corrugated knife is brought down, which shears the plate in a number of places, commencing at the point of each corrugation and shearing in both directions from this point, the travel of the knife being not great enough to entirely sever this strip from the sheet, but serving to depress it in a series of corrugations, the upper points of which remain attached to the sheet for a short distance. The upper knife is then raised to clear the plate, which is pushed forward another short distance and at the same time shifted lengthwise of the lower knife. This brings the points of attachment of the corrugations or loops to the plate under the lower points of the corrugations in the upper knife, and when the knife is again forced down the first points of operation and shearing are the points of attachment of the previously formed series of loops, and these points while being at the upper angles of one bent strip are at the lower angles of the next one, thus forming a series of openings or meshes. Each portion of the strip which goes to make up one half of any given opening is sheared away from the sheet, commencing at the middle of the opening which is being started during that cut, the shearing proceeding in each direction from this point out to the ends of these particular loops. The metal is stretched at the same time that it is sheared, owing to the natural fact that the loop when pressed down must be longer than the straight line from which it is pressed, the two ends of the loop being held at fixed points on the plate. The description of the operation 324 of a machine for making expanded metal, patented by J. F. Golding on May 4th, 1897, No. 581,713, very fully and completely explains the operation of making expanded sheet metal of the patent in suit.

Q. 5. I show you a prior patent of Golding and Durkee, No. 320,242, and call your attention to that part of the specification which reads as follows:

"It is evident that the meshes could not be cut and simultaneously formed if the cuts were made in a single direct line across the metal, for the reason that as the meshes are made the article which they form is contracted to a length less than the original length of the metal from which it is cut."

What do you understand to be meant by this statement?

A. I understand from this statement that the inventor considered it necessary to so treat the plate that the finished expanded metal would be contracted to a length less than the original plate, owing

to the fact that he did not consider that the metal would stretch sufficiently to maintain the same width in the finished article as in the blank; and he is undoubtedly correct in this view to the extent that very thin sheets of steel could not be drawn out into large meshes and still maintain the same width, as it is well known that the amount which steel will stretch depends very largely on the thickness. Thus a piece of steel 1/100 inch thick, of a given length, will only stretch about 1/10 as much as one an eighth of an inch thick, so that operation of making expanded sheet metal explained in the patent in suit could not be used where large meshes are desired in very thin material. From the language mentioned, I think it is perfectly plain that the inventor had thought of having
the cuts "made in a single direct line across the metal," but
325 he saw with entire clearness that this would be impossible
where thin sheets were to be used and large meshes produced,
which was the condition in respect to a large amount of expanded metal manufactured where very thin sheets were used and large meshes formed by the means set forth in this Golding and Durkee patent, No. 320,242. Large amounts of metal were made into expanded sheets by machines operating as described in this patent on very thin sheets, forming comparatively large meshes, while meshes similar in size from the same gauge of thin plates could not be formed at all by the machines described in the patent in suit and in patent to Golding No. 581,713, which latter machines can only work where the thickness of the metal is considerably greater in proportion to the size of the mesh than is necessary in the case of the arrangement set forth in the patent to Golding No. 320,242.

Q. 6. In view of the statement made in the patent No. 320,242, quoted in the last question, please state whether anything substantially new is set forth in the patent in suit?

A. There does not seem to be anything substantially new set forth in the patent in suit, except perhaps that the patentee recognizes that in making the heavier weights of expanded metal the steel can be safely counted on to stretch the requisite amount, although it would not do so where very light sheets are used in the way set forth in the patent in suit. In other words, Golding and Durkee, in patent No. 320,242, described very ingenious means for making expanded metal involving comparatively small amount of stretching of the material, and stated that the meshes could not be cut and simultaneously formed if the cuts were made in a single direct line across the metal; whereas Golding, in 1894, seems to
have recognized that, in some cases at least, the intricate
326 machinery used to perform the operation described in patent
No. 320,242, is not necessary, and that he was able to dispense with and come back to the obviously simple scheme of making his cuts in a direct line across the plates; or, in other words, that the older and very ingenious device gotten up to avoid the trouble incident to a limited amount of stretch in the material was not in all cases a necessity.

Q. 7. Referring still to Golding & Durkee patent No 320,242, and to their patent No. 320,241, describing the machine for making the product of the patent No. 320,242, please state whether any process is described in the patent in suit which is substantially different from what is described in the two earlier patents here mentioned other than mere functions or operative effects of the machines employed?

A. There is no process described in the patent in suit which is substantially different from what is described in the earlier patents. Both machines simultaneously cut and expand the metal by a series of alternate cuts, the alternations being caused in the earlier machines by feeding the sheet obliquely and being caused in the later machine by shifting the knives between the cuts or shifting the sheet relatively to the knife. Both machines stretch the metal, the later machine stretching the metal on both sides of the point of cutting knife and to a greater extent than the earlier machine which stretched the metal on one side only of the point of the knife. Of course the operative effects of the machines employed are somewhat different, because in the earlier machines the cutters were oblique to the line of feed, whereas in the machine of the patent in suit the cutters are set at right angles to the line of feed. This of course constitutes a difference in mechanism, and the older machines would work on some classes of material better than the new 327 one will; although, where the material is suitable for being worked on the new machine, the latter is a simpler and better one, and the arrangement of the knives keeps the metal more readily under control. I see nothing here, however, which could be called a new process; merely a difference in machines.

Q. 8. Is there any useful change in the state or condition of the metal produced by the operation described in the patent in suit as distinguished from the operation described in the earlier patents of Golding?

A. No, there is no useful change in the metal. The only change in the condition of the metal is that in the operation described in the patent in suit the metal is stretched considerably more than it is in the operation described in the earlier Golding and Durkee patent. This additional stretching of course hardens the metal, making it at the same time brittle, so that it is customary where the metal has been considerably stretched in expanding to anneal the product before use, by heating it up to a red heat and allowing it to cool, which to a large extent remedies the brittleness caused by the harsh treatment of the steel. In metal expanded by the older Golden and Durkee scheme the metal would not be tortured so much and hence there would not be as great need for annealing it, and as a matter of fact I think a very small portion of the expanded metal made under this old patent, if any, was ever annealed in practice. Of course, annealing, to a large extent, removes brittleness caused by harsh treatment, softens the steel and lowers its tensile strength down to what it was in the original plate or possibly still lower. To the extent, however, that this operation makes annealing necessary, it is a bad one, and it will require a better and softer steel to use it than would be necessary with the older operation, other things being equal. The

28 fact that all heavy expanded metal intended for use in concrete construction, where strength and reliability is important, is in practice annealed, shows that the change in the metal, ue to the large amount of stretching, is one that is not desirable itself.

Q. 9. Is it true that by the operation and machine described in the atent in suit any saving of metal is obtained by reason of the in- rease of area without lateral contraction of the sheet?

A. No, there would be no saving in metal due to maintaining the rea of the sheet, as the metal would have to be thicker to start with, compensate for the thinning of the metal due to stretching; in ther words, to have the same cross-section in the strands the same eight of steel must be used in each case, and you cannot make mething out of nothing no matter what machine you used for itting and bending it. In other words by the new process you would et a wider piece of expanded metal from a given width of plate, ut the plate itself would have to be thicker in the same proportion, that there is no economy of metal obtained.

Q. 10. Is there any advantage obtained by the operation and ma- hine described in the patent in suit in respect of rectangular shape r greater strength or more regular strength of the meshes of the ex- anded metal?

A. The machine described in the patent in suit is simpler, and onsequently easier to keep in adjustment than a machine adapted to o the work called for by the older Golding and Durkee patent, and therefore will probably make the meshes more symmetrical, other hings being equal, than the older machine. It will not, however, ake metal of any greater strength. In fact if we take two plates xactly alike and expand one on the old machine and one on the new nd then use the product without further treatment, such as anneal- ng, the expanded metal made on the old machine would be infinitely better than that made on the new, and no constructor would 29 use the latter in a place involving strength and reliability if he would obtain the former. Of course the fact that the mpler machine may make more regular size of meshes is no war- ant for thinking that its operation brings in any new process. Some achines are better than others and do more accurate work.

Q. 11. Is the machine and operation of Golding and Durkee's arlier patents, Nos. 320,241 and 320,242, impractical or undesir- ble?

A. No, it is neither impracticable nor undesirable. The Expanded letal companies of this country have made and are making a large mount of expanded metal on these older machines, especially in the ghter gauges used for lathing.

Q. 12. What, then, is the advantage derived both from the ma- hine and the operation described in the patent in suit?

A. The machine described in the patent in suit is better than the lder machine, because it is much simpler and easier to construct. he knife engages the sheet from end to end, and the lower knife a perfectly plain, straight shear blade which can be made of any hickness desired. and the upper knives may also be made of any

thickness desired. The width of the strand can be varied by merely changing the feed, whereas in the old machines the knives had to be changed or the inclination varied. Moreover, as the knife acts simultaneously from end to end of the blank, it produces a more accurately uniform size of mesh. In the old Golding machine the lower knives travel endwise at the same time that the metal is being cut over their edge, making it very difficult to maintain in perfect adjustment. These are all mechanical advantages due to the use of a better machine, and have nothing whatever to do with any new
process or method. Another advantage is that the cutters
330 can more easily be ground and their shape better maintained
than in the older machine.

Q. 13. It has been suggested that the operation of the machine of the patent in suit enables the manufacture of expanded metal from thicker gauge sheets than could be used with the earlier machines. Is this correct?

A. This, I think, is a misstatement in that it does not represent accurately the facts. The fact is as shown by Golding's patent above referred to, that the natural way to make expanded metal is by a machine whose cutters act simultaneously and directly from end to end of the blank; but that such machine, on account of its inevitable stretching of the metal, cannot be used on thin gauge sheets without tearing such a large proportion of the strands as to make the waste unduly great and that this natural type of machine can, therefore, only be used successfully and is used only on thicker gauges of metal, except where the diamond meshes are only slightly opened out. The thicker metal can be stretched farther without breaking, because the strands have more metal in them, just as a thicker rod can be stretched farther than a thin rod without breaking. The former machine could have been used with heavy metal if made strong enough.

Cutting, bending and stretching metal is necessarily the obvious function of a machine, since it is not possible to combine them except in the operation of a machine. To conceive that an object can be accomplished by simultaneously cutting, bending and stretching parts of a metallic sheet involves no invention, unless the three principles are organized in a machine. Hence, the invention must reside in the machine.

Q. 14. In X Q. 158, Golding says, referring to his prior patent:
"The art of cutting, bending and stretching the metal by
331 cuts made in a straight line for the purpose of forming a
series of meshes, was unknown at the time this specification
was written."

Assuming this to be a correct statement of Golding's invention, what does it show as to the character thereof—whether it is a method or a function of a machine?

A. Assuming that this statement is correct, I cannot see that the new machine involved any new process. The patent to Ohl, No. 475,700, showed clearly and conclusively that cuts could be made in straight lines across the plate and the metal stretched; or at least that Ohl thought so; and the fact that his machine was successful was proof positive that this could be done. Therefore, although a new machine to do this may have possessed great merit, it could not be said to involve any principle new in the art. In fact, if we take the claim of the patent in suit and apply it to the product shown in the Ohl patent No. 475,700, the correspondence is perfect.

Q. 16. In view of the prior patent of Ohl, No 475,700, and the patents of Durkee and Golding Nos. 320,241 and 320,242, will you please state whether there is anything substantially new in the *method* stated in the claim of the patent in suit other than a mere difference in machines?

A. No, there is not. Each of the machines simultaneously slits, bends and stretches the metal. It is true that one stretches it more than the other, and one machine has simpler knives than the other; in one the sheet is fed in diagonally, and in the other straight; but I should judge that a man might invent a dozen of machines and if each would slit, bend and stretch the metal simultaneously, even if each fed the sheet in in a different direction, and if each differed from all of the others in the shape of the knives, in the percentage of stretch given to the steel strand, in the method 332 of operating the feed and of operating the knives, I do not believe that there could be said to be any difference in method involved in any one of them, other than a mere difference in the machine. One might be simpler than another; one might be easier to keep in repair than another; one might do nicer work with less torture to the steel going through it; but these would be simply good points in the machines and might entitle the inventor to a patent for them, but they certainly would not create the presumption of any new method in the art.

Q. 17. Is there any new method proper, so called, in the operation described in the patent in suit?

A. No, there is not. It is old in the art of making expanded metal to slit the metal, at the same time stretching and bending it, and there is no new method involved in inventing a machine which will slit, bend and stretch the metal in a different way, as these are purely mechanical operations, the same as squeezing a butterball or molding a brick; acting to change the form of the metal, and having no effect on its other qualities, except incidentally such effect as is liable to be produced upon metal by forcibly changing its form; especially where this effect has no beneficial effect on the product but is rather a necessary evil incident to the operation of the machine. The patent in suit seems to be an attempt to cover the function of a guillotine machine, the knives of which are set in a row and operate in a straight line across the sheet, instead of operating in a zig-zag fashion, the result of which is simply to produce a product which is different from the product of the diagonal feet machines for the same reason that many new machines produce a better product than older and more complicated machines without involving anything which could in the slightest degree resemble a difference in 333 method or process. Because one man has invented a machine which will shear a plate of steel and give a certain percentage of stretch at the same operation, it would seem hardly fair to say that no one else should be allowed to invent another machine to accomplish the same result, the work of the machine being purely mechanical and confined to changing the form of a sheet of metal, the resultant product being something which is old in the art.

Q. 18. In your opinion is the large increase in the use of expanded metal during recent years due to the patent in suit, or to the machine described therein?

A. It is due to neither; but simply corresponds with the enormous increase in the use of steel in construction in other lines. Large modern office buildings have called for vast quantities of structural steel, and the increasing use of concrete has brought about the consumption of large amounts of expanded metal for strengthening it; and also a great deal of expanded metal has been required for partitions in fireproof buildings. I have no reason to think that the use of the new type of machine has made any appreciable amount of expanded metal used. There has been an equally large increase in the use of bars for use in concrete, which bars are made in many different patterns, and the consumption of which is entirely independent of any particular form of bar or process of making them. The new Golding machine has some mechanical advantages for certain classes of work; but to enumerate the steps which this machine goes through in forming a plate of steel and call them a process seems absurd and far fetched.

Adjourned to meet pursuant to notice or agreement of counsel.

334 NEW YORK, N. Y., *May* 10, 1906.

Met pursuant to agreement of counsel at the office of Bakewell & Byrnes, No. 31 Nassau street, New York.

Present: Same as before.

Cross-examination by Mr. HUNTER:

X Q. 19. Have you ever witnessed the actual production of expanded metal?

A. Yes.

X Q. 20. Where?

A. At the works of the General Fireproofing Company, Youngstown, Ohio.

X Q. 21. Was the metal which you saw produced at the works of the General Fireproofing Company at Youngstown, that metal the production of which it is alleged is an infringement of the process patent involved in this suit?

A. I saw metal drawn out into expanded metal in a manner similar to that described in the patent in suit.

X Q. 22. Is it not a fact that in that method or process of making expanded metal, there is produced upon each operation of any cutter, a strand which constitutes one-half of the finished mesh, the other half of the mesh being produced by the formation of strands due to the action of the cutters on the next operation?

A. Yes, one cutter in one operation forms one-half of the finished mesh, the other half being formed by the action of part of two cutters.

X Q. 23. And it is impossible, is it not, in the practice of the method described in the patent in suit, to produce a complete mesh by any one operation of the cutters?

A. Yes.

X Q. 24. And the expanded metal is produced by the
335 formation of alternately disposed rows of half meshes?

A. Yes.

X Q. 25. Is it not also true that the impossibility of producing a complete mesh upon any one operation of a cutter is due to the fact that the two ends of the strand being formed are connected or united to the body of the sheet?

A. No, I don't know that this could be said to be the reason why complete mesh is not formed by one motion of the cutter.

X Q. 26. Well, why is it?

A. I don't know that I can tell why; the machine doesn't do it.

X Q. 27. Have you ever seen metal produced in the manner described in the Golding & Durkee patent 320,242?

A. I have not seen the operation of the machine producing it. I have seen metal which I understood was produced in that way.

X Q. 28. Is it not the fact that in the production of expanded metal in the manner described in this patent 320,242 complete meshes are formed upon each operation of the cutter?

A. Yes.

X Q. 29. Will you explain why it is that a complete mesh is formed upon each operation of the cutters according to the method described in patent 320,242, while such is not the case according to the method described in the patent in suit?

A. One machine was designed to do it one way, and the other, the other. The machine which I saw working, made practically a row of meshes to each stroke of the knife, the knife forming a half of one row of meshes the first stroke, the second stroke forming the remaining half of this row of meshes and one-half of the second row, so that this machine had one stroke of the knife for each row of meshes, with one additional stroke in the lot made from
336 one plate. The older machines of Golding and Durkee made one row of meshes with one stroke of the knife, but required several additional strokes at each end, owing to the fact that the first stroke in starting a new plate only made one mesh, and the succeeding one an increasing number of three, five, etc., until the entire width of the plate was embraced between the knives, thus requiring several more strokes for a given number of rows of meshes than is required in the newer machines.

X Q. 30. When you say that the machine which you saw working—which I understand to be the machine the General Fireproofing Company use at Youngstown—each stroke of the knife made practically a row of meshes, do you not mean this; that each stroke of the knife after the first forms a row of half meshes, the strands of which form with the row of half meshes previously made on the preceding stroke of the knives, the row of completed meshes? Is not that what you mean?

A. Yes, I suppose it might be stated in this way correctly.

X Q. 31. And it is true that in the process described in the patent

320,242, any stroke of the knives forms a row of complete meshes, and does not have anything to do with the production of either the preceding or succeeding row of complete meshes?

A. If by "meshes" you mean the area of opening not occupied by metal, this is true. If by "mesh" you mean the four strands bounding a vacant space, it is not true.

X Q. 32. Have you ever seen metal of the character described in the Ohl patent 475,700, to which you have referred?

A. I think I have, but am not certain.

337 X Q. 33. Understanding that expanded metal is a reticulated sheet formed by enlarging a sheet of metal into an area greater than the original blank, do you consider that the Ohl patent describes expanded metal or a machine capable of producing it?

A. If "expanded metal" is metal in which a sheet is enlarged into a greater area of outside dimensions, the Ohl process would not produce it, although the superficial area of the sheet is increased in the Ohl process, and the space occupied in the direction of thickness is also increased, but the length and width are not increased.

X Q. 34. Do you consider in instituting a comparison between the Ohl patent and the patent in suit, that the loops in the Ohl patent, S′ are to be considered as similar to the half meshes of the patent in suit?

A. Yes, as far as slitting, bending and stretching simultaneously are concerned; they are exactly similar.

X Q. 35. And is it possible, following the Ohl patent, to so alternate these rows of loops S′ that the production of each succeeding row after the first will result in the formation of strands which with the row of loops previously formed will produce completed meshes?

A. No, the Ohl machine did not do this.

X Q. 36. And could not do it?

A. No.

X Q. 37. You have, I believe, stated that expanded metal with large meshes could not be made from very thin sheets by the process described in the patent in suit. In order to make your meaning clear, will you please explain what you mean by "large meshes" and "very thin sheets?"

338 A. Perhaps my expression "large meshes" would be more accurate if stated as "meshes large in their short diagonal, or meshes approaching a square." Of course it is perfectly evident that meshes could be made as long as you please by the method shown in the patent in suit if the other axis of the mesh was made comparatively short, but to take a mesh, say two inches long, and push it down so as to have the other diagonal two inches would be impossible with very thin sheets of steel. This dimension of course could be made greater for a given thickness if a still softer material, such as copper, was used; but the general principle is that by this method of working the deeper the mesh required the thicker the given material would be required to be to make it successfully.

X Q. 38. And what do you mean by "very thin sheets?"

A. I don't think it would be possible to make meshes an inch square by this method out of No. 32 sheet steel, of ordinary quality, although it would be possible under the old Golding and Durkee method.

X Q. 39. Why is it possible under the Golding and Durkee patent 320,242, to make large meshes from very thin metal, and not under the method of the patent in suit?

A. Because the method of the patent in suit would involve a greater percentage of stretching to push the metal into the form of these square meshes than was caused by the action of the older Golding and Durkee machine.

X Q. 40. Considering the practical uses to which expanded metal is put, what is, in your opinion, the largest mesh that would be required with the lightest metal?

A. I don't have any opinion on this. I do not know what would be the largest required with the lightest metal.

X Q. 41. For the uses of expanded metal with which you are familiar, is it not true that very thin sheets can be used only with expanded metal having small meshes. I am referring, for example, to such metal as is used for metallic lathing, where strength
339 is not of great importance, and the strands apt to hold plaster.

A. In this case, the meshes would naturally not be very large, but just what the limits would be I cannot say.

X Q. 42. Do you know the smallest gauge of sheets practically and successfully used in the making of expanded metal by the process of the patent in suit?

A. Not definitely. This would, of course, depend on the shape of mesh required. If the depth of mesh were say only one-fourth of its length, quite a light sheet could, of course, be used, but with a mesh half as deep as long, I do not think that for meshes, say, an inch and a half long much success would be obtained with an ordinary quality of steel less than about twenty-two gauge in thickness.

X Q. 43. Have you ever made any tests of expanded metal produced in accordance with the process of the patent in suit and the process of patent 320,242, to determine the relative tensile strength of the strands?

A. No.

X Q. 44. You have made the statement that all heavy expanded metal intended for use in concrete construction where strength and reliability is important, is in practice annealed. Upon what personal knowledge or information do you base this statement?

A. I have seen a great deal of annealed metal used in concrete, and have not seen any heavy expanded metal used without annealing. Of course, I cannot say from my own knowledge that none at all has been used anywhere.

X Q. 45. When you say that it is old in the art of making expanded metal to slit the metal at the same time as stretching and bending it, to what do you refer?

340 A. To the Ohl machine and the Golding and Durkee machine.

Cross-examination closed.

Recess until 2 P. M.

Redirect examination by Mr. Byrnes:

R. D. Q. 46. Referring to your answers relating to the difference in the operation of the machine of patent 320,242 and the operation described in the patent in suit, will you please explain briefly your views as to this matter?

A. In the operation shown in No. 320,242, one of the cutters pushes down two sides of the mesh, at the same time that the adjacent cutter pushes down two sides of the next mesh. These are pushed down in a diagonal direction so that at the completion of the operation the level of the lower knives coincides with one side of the diamond-shaped opening instead of with the long diagonal of the opening, as in the case described in the patent in suit. The one cutter, therefore, cuts the same portion of the mesh in each case, but the action being on a diagonal line in the operation described in 320,242, leaves the opening in its finished form, but one bar bounding this opening has not yet been slitted away from the plate. So that if we consider the opening as being a mesh it is completely formed, but if we consider the mesh as made up of four strands surrounding the opening, it is not finished until the next operation. The total number of strokes of the knife will be the same for a given number of meshes in each case, with the exception that when operating as described in No. 320,242, a few extra cuts have to be made at the ends, owing to the fact that only a portion of the knives are operative at these points.

R. D. Q. 47. Do you wish to be understood in any of your answers in cross-examination as admitting or agreeing that 341 there is a technical process or method disclosed in the patent in suit?

A. No, I do not. Wherever the word "process" or "method" has been employed, either in a question or an answer, I have taken it to mean the description of the way certain machines operated, and have not intended to convey the impression that there is anything in their operation which could be called a process or a method in the technical sense in which these words are used with reference to patents.

By Mr. Hunter:

R. X Q. 48. Please define a method or process, as you understand it, in the technical sense in which the term is used in relation to patents?

A. With the general understanding that my opinion is probably entirely worthless, my understanding is that a process or method patent generally embraces operations which have for their object the change of the characteristics of the material operated on, as distinguished from change of form of material, which may be the function of a machine.

R. X Q. 49. Then I presume, that as you understand the matter, no process or method, in this technical meaning, could reside in the cutting, bending and opening up of a sheet of metal so as to change it from a flat, solid plate into a reticulated sheet of expanded metal?

A. No, I think not, in any way that I have known of its being done.

Deposition closed.

JULIAN KENNEDY.

342 *Examiner's Certificate.*

STATE OF PENNSYLVANIA,
County of Allegheny, ss:

I, George B. Bleming, a notary public, within and for the County and State aforesaid, and special examiner by consent of counsel, to take the testimony of the witness, Julian Kennedy, on behalf of the defendant in the suit of the Expanded Metal Company *vs.* General Fireproofing Company, in the United States Circuit Court for the Northern District of Ohio, Eastern Division, do hereby certify that on the 26th day of April, 1906, I was attended by Ernest Howard Hunter, Esq., counsel for complainant, and Messrs. Bakewell & Byrnes, counsel for defendant, and by the witness, Julian Kennedy; the said witness being of sound mind and lawful age, having by me been carefully examined, cautioned and sworn to testify to the truth, the deposition was taken by myself at Pittsburg, and by Anne E. Wallace, at New York City, under my direction; that the deposition was read over by the witness before he signed the same. I further certify that the foregoing is a true, full and correct record of the proceedings had, the objections made, the offer of exhibits in evidence, and that I am not of counsel or related to either of the parties, or otherwise interested in the event of this suit.

In testimony whereof, I have hereunto set my hand and affixed my notarial seal this 15th day of May, 1906.

[SEAL.] GEO. B. BLEMING,
Notary Public and Special Examiner.

My commission expires March 19, 1909.

343 United States Circuit Court, Northern District of Ohio, Eastern Division.

THE EXPANDED METAL COMPANY
vs.
THE GENERAL FIREPROOFING COMPANY.

Testimony in behalf of defendant taken before George H. Sonneborn, Notary Public, as Special Examiner, on April 4, 1906, at the office of Thomas W. Bakewell, No. 31 Nassau street, in the City of New York.

Met pursuant to agreement.

Present: Ernest Howard Hunter, Esq., for Complainant; Thomas W. Bakewell and Harold Binney, for Defendant.

Deposition of Herbert E. White.

Q. 1. Please give your name, age, residence and occupation.

A. Herbert E. White; thirty-two years; Youngstown, Ohio; mechanical engineer. I am chief engineer of The General Fireproofing Company. I also act in advisory capacities as engineer to the National Light & Thorium Company.

Q. 2. Please state your experience as a mechanical engineer, and particularly in respect to open-work metal structures, such as lathing and the like.

A. I am a graduate of the mechanical engineering depart-
344 ment of the University of Pennsylvania, and have been en-
gaged since 1896 in the manufacture of various forms of expanded metal lath and in the designing of machinery for manufacturing expanded metal lath. My earlier experience in the expanded metal lath business was principally in connection with the manufacture of expanded metal lath which was the invention of D. B. Hilton, the factory being located in Brooklyn, N. Y. Later on, about 1899, I invented the lath now known as herringbone expanded steel lath, and I subsequently designed and patented machinery for manufacturing this lath. Later on, in 1902, I designed and built machinery for the manufacture of heavier expanded metal. Meanwhile I designed also machinery for the manufacture of a trussed form of herringbone lath, this form of lath having been patented by C. B. White. I also designed and patented machinery in connection with other arts, such as the manufacture of incandescent gas mantles.

Q. 3. What are the principal uses of the various form of expanded metal structures?

A. Practically all the expanded metal is used for lathing and for reinforcing concrete. Ever since I have been connected with this industry I have been looking for additional uses to which expanded metal might be put, but up to the present time have not succeeded in developing any material market for it outside of its use for building construction; that is, for plastering and for reinforcing concre

in its various forms. I have made it part of my business to follow up the material as closely as possible to see where and how it was used, with the result that I found very little used for any other purpose than that specified. The amount of the expanded metal used for purposes other than lathing and reinforcing concrete, such, for example, as window-guards, lockers, tree-guards, fence, sky-
345 light covers, etc., is negligible, amounting to not more than 3 or 4 per cent. The market for expanded metal structures for such purposes would not warrant the construction of a separate plant for its production. Wire fabric is almost universally used for such purposes, owing to the fact that it is furnished in continuous rolls of almost any width required, and can be cut to size without waste; and moreover, is readily attached to frames for holding it in position. Furthermore, wire is cheaper than expanded metal.

Q. 4. Are you familiar with the inventions described in the earlier Golding patents, Nos. 320,240, 320,241, 320,242, 381,231 and the Golding and Durkee patent No. 381,230, and also the Golding patent in suit, No. 527,242, and the Golding machine patent No. 581,713?

A. I am familiar with all of them.

Q. 5. And are you familiar with the particular form of expanded metal made by the Golding and Durkee machine of patent No. 381,230?

A. I am.

Q. 6. To what use has such expanded metal been put?

A. It is used for lathing and also for reinforcing concrete.

Q. 7. What proportion of expanded metal is used for lath as compared with the proportion used for reinforcing concrete?

A. The lathing is sold by the square yard and the material for reinforcing concrete is sold by the square foot. About 80 per cent. of the product of the General Fireproofing Company is sold for lathing purposes and about 20 per cent. for reinforcing concrete. The quantity sold for other purposes is so small as to be practically negligible. The proportions given are based upon area. From my knowledge of the trade conditions, I should say that these proportions fairly represent the consumption of this class of material
346 throughout the United States.

Q. 8. I notice that the Golding & Durkee patent No. 320,242 in figure 1, and the Golding & Durkee patent No. 381,230 in figure 1, show the diamond-shaped meshes regular in form and appearance and exactly at right angles with each other, so that a line through the intersections of the meshes in one direction is at right angles with a line drawn through the intersections in the other direction, and the figures 12 and 14 respectively of these two patents seem to show the same thing in perspective. What is it that determines whether the meshes shall be regular and at right angles in the various earlier patents of Golding and of Golding & Durkee?

A. The form of the mesh is determined by the design of the dies. By this I mean the shape of the upper and lower cutters which in co-operating act on the metal sheets. The shape of the mesh may be modified by the stroke of the machines, or by the distance to which the cutters penetrate the sheet. This being the case, one machine,

as for instance that shown in patent No. 381,230, by a simple modification of the cutters or a variation in the stroke of the machine, could be made to produce a variety of forms of mesh. The form of the mesh is not a question of the process employed, but is a question of the form of the dies used for cutting and expanding, since it is evident that the regularity or irregularity of the mesh formed will be dependent upon the cutters and the length of the stroke rather than upon the process or principle of operation employed. The rigidity of the machines will also play a prominent part in the regularity of the mesh, since, if the machine be so light as to spring materially, the meshes will obviously be irregular. The condition of the cutters as regards their sharpness is also a consideration, as a dull cutter, which will tear the metal, will manifestly more or less
347 distort the metal.

Q. 9. I notice that the expanded metal purporting to be manufactured under Golding's second process and by the machines of Golding and Durkee's patent No. 381,230, or at least those that have been offered in evidence, show a ragged appearance. To what is this due?

A. Many of the samples that I have seen are more or less ragged, that is, the cuts are ragged and uneven, due to the fact that the cutters were dull or not held up firmly against one another, due possibly to the springing of the machine. This same condition would occur under the patent in suit, were the knives allowed to become dull or the machine allowed to spring, or the knives allowed to become separated from one another. This results in more or less tearing of the metal, leaving a fin along the cut edge. It also results in a variation of the width of the strand. As a rule this variation takes the form of causing the strand to be wider at one end than at the other, that is, the strand is tapered.

Q. 10. Can you tell me how much stretch due to the shearing and expanding operation of Golding's second process would necessarily occur?

A. In cutting a straight strand from a flat sheet, both ends of the strand remaining attached to the sheet, the metal is necessarily stretched at least about twice the thickness of the metal, and the percentage of stretching is dependent upon the length of the cut and the thickness of the metal. For instance, in making a cut six inches long in a sheet one-eighth inch thick, the stretch would be one-quarter inch, or approximately four per cent. In practice, the strands are not cut straight, but one of the cutters is always crowned, that is, curved or pointed to a greater or less extent, and the amount of stretch in the metal of the strand will always be more when cut with a crowned cutter than with a straight
348 cutter, this additional amount of stretch being dependent
upon the amount of departure of the cutter from a straight line.

Q. 11. Have you examined complainant's diamond mesh lath to ascertain what the stretch is in manufacturing under the process in suit, and have you read and do you understand the patent in suit?

A. I have examined such lath and I have read and understand the Golding patent in suit. I find that in the 24 and 26-gauge diamond mesh the stretch is about 4 per cent. I have examined also the lath known as ½-inch 18-gauge diamond mesh, and find the stretch to be 6.4 per cent. In the ¾-inch 13-gauge diamond mesh I find the stretch to be 11.5 per cent. In the 1½-inch 12-gauge diamond mesh I find the stretch to be 9.6 per cent. In the 2-inch 12-gauge diamond mesh I find the stretch to be 10.7 per cent. In the 3-inch 10-gauge diamond mesh I find the stretch to be 11.3 per cent. In the 6-inch 4-gauge diamond mesh I find the stretch to be 10.6 per cent. I might add that in mentioning the sizes of these various meshes, that is, ¾″, 1½″, 2″, 3″ and 6″, I have used the trade designations, the meshes themselves not conforming exactly to these figures. I have had made and here produce full-sized blueprints showing all of these various size meshes.

Defendant's counsel offers in evidence the seven blue-prints referred to and produced by the witness, and the same are marked "Defendant's Exhibit White's Blueprints Diamond Mesh Measurements."

Q. 12. If these same meshes had been made by Golding's second process, even without the incidental stretching due to cutting, how much shorter would the sheets be?

A. The sheets would be shorter by an amount equal to the
349 stretch which I have named. As there is always the incidental stretching due to cutting, that stretch must be deducted from the shortening of the sheet.

Q. 13. Reference has been made to the avoiding of waste in manufactuirng lathing under the patent in suit. Is there not waste under the patent in suit?

A. In manufacturing laths under the process in suit there is always a waste strip of uncut metal the whole length of the sheet and at least an inch in width equal to about eight rows of meshes, the width being a more or less variable quantity owing to slight irregularities in the feed. An inch is about as narrow a strip as can be firmly held by the clamp which is used to securely hold the sheet while it is being cut and expanded.

Q. 14. Who invented and designed the machine which the defendant company uses to make diamond mesh lathing with stretched strands?

A. I did. This machine is the subject-matter of an application now pending, all, or practically all, of the claims of which have been allowed.

Q. 15. Have you any objection to testifying in regard to the exact structure of that machine?

A. Yes, prior to the issue of the patent.

Q. 16. Have you personally had charge of the manufacture by the defendant of diamond mesh lathing of the form shown in "Complainant's Exhibit No. 1 Sample of Defendant's Expanded Metal Manufacture"? If so, what is the percentage of stretch in such laths?

A. In the neighborhood of ten per cent.

Q. 17. Is the effect of this stretching beneficial or detrimental in lathing, and particularly lathing that is to be used for reinforcing concrete?

A. The effect of stretching the metal to this extent is very detrimental, especially when the mesh is to be used for reinforcing concrete. The stretching makes the metal very hard and brit-
350 tle, so that it cannot be bent to any great extent without breaking it; in fact it frequently will not stand ordinary rough handing of the bundles of sheets such as they would get around a building operation or in transit. It would be very unwise to use steel in this condition for reinforcing concrete, since it might fail absolutely without warning owing to its extremely brittle character. In a great many cases it is as brittle as hardened tool steel. It is for this reason that we make a practice of annealing all of this diamond mesh for reinforcing concrete.

Q. 18. If the effect of the stretch were in fact beneficial at all how would the annealing affect the alleged beneficial qualities?

A. The annealing would destroy such alleged beneficial qualities, since its effect is to restore the metal to its original condition, that is, to the condition in which it was before stretching, in some cases even to a softer condition than originally.

Q. 19. Assuming that Mr. Golding had testified that Mr. Garrison was a member of a corporation handling large quantities of expanded metal, and that such metal as they handle was made by Chess Brothers—that is, the Central Expanded Metal Co. of Pittsburg, and was annealed before it was sent out, how would this state of facts, in your opinion, affect the value of any supposed benefit due to the stretching of the metal under complainant's patent?

A. This annealing would destroy any alleged beneficial effects on the metal due to the stretching, and this annealing is undoubtedly done by the complainant's licensees owing to the necessity of getting rid of the injurious effects of the stretching of the metal. Our experience has shown us that we can only use the very highest quality of metal, and that even this must come to us in the best possible condition as regards uniformity of composition and softness, and any stretching and hardening due to the treatment of the
351 metal in its manufacture into mesh, detracts from the quality of the product.

Q. 20. Is the stretching ever beneficial in any way?

A. No.

Q. 21. Have you examined the following patents, and if so, please state what these show in reference to simultaneously cutting, forming or expanding, and stretching to allow such forming or expansion:

No. 459,625, W. W. Bostwick, September 15, 1891.
No. 489,850, M. H. Crittenden & T. V. Emery, January 10, 1893.
No. 460,850, C. H. Curtis, October 6, 1891.
No. 408,599, I. S. Elkins, August 6, 1889.
No. 475,700, G. A. Ohl, May 24, 1892.
No. 447,085, L. L. Sagendorph, February 24, 1891.
No. 459,726, H. A. Stone, September 15, 1891.
No. 459,727, H. A. Stone, September 15, 1891.

A. I have examined all of these patents. The patents of Bostwick, Crittenden & Emery, Curtis, Elkins, Ohl, Sagendorph, and the two Stone patents, all clearly disclose the fact that the metal is cut, bent and stretched simultaneously, both ends of the strand being still attached to the body of the sheet in the same way as in the patent in suit. All of these patents are either for open-work lathing or the machinery for producing open-work lathing.

Q. 22. In all these laths shown in the patents you have mentioned, what is the length of the finished lath as compared with the original sheet?

A. The finished lath is exactly the same length as the original sheet.

Q. 23. What is the amount or stretch of the bent portions or strands in these various patents you have mentioned?

352 A. The stretching of the metal as shown in these patents varies from a few per cent. up to the case of the lath shown in the Ohl patent, where the stretch is about fourteen per cent., this being in excess of the stretching shown on any of the Golding laths which I have examined and referred to in the blue-prints which I have submitted.

Q. 24. I notice the patent in suit refers to the early patents Nos. 381,230 and 381,231, which operate according to the alleged process of the Golding & Durkee patent No. 320,242, in which I find this statement by Mr. Golding and Mr. Durkee:

"It is evident that the meshes could not be cut and simultaneously formed if the cuts were made in a single direct line across the metal, for the reason that as the meshes are made the article which they form is contracted to a length less than the original length of the metal from which it is cut."

Is this, in your opinion, correct or consistent with the facts that are known?

A. This statement is not correct. For instance, the Bostwick lath shown in patent No. 459,625, of September 15, 1891, could be made by making the cuts in a single direct line across the length of the sheet, as there is no tendency whatever for the sheet to contract in length. This is equally true of the forms of the Elkins lath, patent No. 408,599, August 6, 1889, shown in Figures 1 and 3. I have personally made pieces of the form of the Elkins lath by means of a row of cutters set in a press and operating against a stationary die having straight edges. The stretch was fully as much as in the patent in suit, and the length of the plate of metal was not in any way affected.

353 New York, May 10, 1906.

Cross-examination by Mr. Hunter:

X Q. 25. Have you ever seen expanded metal produced according to the method described in the Golding & Durkee patent 320,242, dated June 16, 1885?

A. No, I have not.

X Q. 26. Is it your opinion that as good expanded metal can be produced by the method described in this patent as by the method described in the patent in suit?

A. With a properly designed machine, yes.

X Q. 27. Don't you consider that there is any advantage in the use of the process of the patent in suit over the process described in the Golding & Durkee 1885 patent 320,242?

A. The advantage resides in the machine used to carry out the operation described in the patents referred to.

X Q. 28. But not in the character of the metal produced?

A. I don't think so.

X Q. 29. Am I to understand, however, that you do not think it possible to construct a machine for carrying out the process of patent 320,242 that will be as practical commercially for the production of expanded metal as is possible with a machine for carrying out the process of the patent in suit?

A. A machine for carrying out the operations described in patent 320,242 would, perhaps, not be as practical commercially as a machine for carrying out the operations described in patent in suit, for the reason that the cost of maintaining the former machine would be more, and it does not admit of as rapid changes of adjustment, ease of sharpening cutters, so that on the whole, the cost of operating the machine would be rather higher than would be the case
354 in operating the machine of the patent in suit.

X Q. 30. This is all that you can see in favor of the process described in the patent in suit as compared with the process of the patent 320,242, isn't it?

A. Yes, but the machine of the patent in suit is very much simpler and more readily handled than the machine used to carry out the operations described in patent 320,242. The product of the machine of the patent in suit on the whole will be more uniform than the product of the earlier machine, for the reason that the cutters and the machine generally would be in better order.

X Q. 31. You have, I believe, expressed the opinion that in making expanded metal in the manner described in the patent 320,242, there was a certain amount of stretching. Do you mean by this anything more than such stretching as is incidental to the shearing of metal?

A. There is, in my opinion, more stretching in the operation of the machine of patent 320,242, than is incident to shearing of metal as shearing is usually carried on; that is, by starting at one end of the plate and shearing across the sheet.

X Q. 32. To what is this additional stretching due?

A. This additional stretching is due to the fact that before the upper cutters have penetrated the full thickness of the sheet, so as to sever the strands completely, the two ends of the strand being formed are rigidly attached to the plate and must necessarily stretch a little until the lower cutters have begun to travel endwise so as to allow the newly-formed strand to swing around. This would not be the case with the first strand marked *a* in the drawing of
355 patent 320,242, which strand is in the same position as a strip of metal being sheared from a plate with the ordinary form of shears.

X Q. 33. Have you any idea how much this additional stretching would amount to?

A. The amount of this aditional stretching, as expressed in per cent. of the original length of metal, would depend entirely upon the length of the cut and the thickness of the sheet or plate. For any one strand, the amount of stretching would be approximately twice the thickness of the sheet or plate.

X Q. 34. Are you not now referring to the total stretching which you say would occur in the production of expanded metal according to the method described in the patent 320,242, and not to this stretching which you say you believe occurs in addition to the stretching incident to the shearing of the metal?

A. No. The total stretching will be dependent upon the distance which the upper cutters penetrate the sheet. Up to a certain point there will be practically no stretching other than the amount equal to twice the thickness of the sheet above referred to.

X Q. 35. Well, now, what is the greatest total stretching that you have ever observed in expanded metal made in accordance with the method described in patent 320,242? I refer, of course, to percentage of stretching.

A. I never had an opportunity to calculate the amount of stretch in the product of a machine performing the operations of patent 320,242.

X Q. 36. Have you ever made any effort to determine it?

A. No, for the reason that the data was not available.

X Q. 37. You have in your direct testimony stated that in the practice of the process described in the patent 320,242, making a cut six inches long in a sheet one-eighth inch thick, 356 there would be a stretch of approximately four per cent. Upon what do you base that statement?

A. The cutters of the machine operating as in patent 320,242, present an approximately straight surface to the sheet as they first touch it, and a cutter six inches long penetrating a sheet an eighth of an inch thick, the ends of the strand being rigidly attached at both ends will stretch the strand downward the thickness of the metal at each end, approximately, one-eighth of an inch at each end, if one-eighth of an inch is the thickness of the sheet. The fact that the corners of the cutters are slightly rounded will, of course, modify these figures slightly, the results being only approximate. Twice one-eighth of an inch will make a quarter of an inch, or about four per cent. of the original six-inch length of strand.

X Q. 38. This is based upon the supposition that the ends of the strand are rigidly attached to both ends, is it not?

A. It is based upon the supposition that the ends of the strands are rigidly attached at both ends until the cutter has penetrated to the thickness of the sheet of metal.

X Q. 39. But do not all of the cutters that are acting operate together, so that the cutter at the end is cutting simultaneously with the next cutter in front and is freeing the end of the strand?

A. Yes, it is true that the cutters are all acting to free the end of the strand, but my understanding is that the strand does not become free until the cutter has penetrated to a distance equal to the thickness of the sheet of metal.

X Q. 40. And you think that this stretching will occur notwithstanding the fact that the upper cutter is level and cuts straight down on the material?

A. Yes.

357 X Q. 41. You wish to testify, do you, that in the practical production of expanded metal in accordance with the process described in patent 320,242 with cuts six inches long and a sheet one-eighth thick, the stretch will be approximately four per cent.?

A. I wish to testify that this is my understanding.

X Q. 42. Have you ever known of expanded metal being made by this process from a sheet an eighth of an inch thick?

A. I do not remember having seen any expanded metal made by the machine operating under the patent 320,242 as heavy as an eighth of an inch thick. The figures mentioned—that is, a cut six inches long and metal an eighth of an inch thick—are mentioned as an example.

X Q. 43. What is the heaviest metal that you have ever seen used in expanded metal made under the process of patent 320,242?

A. I think fourteen gauge.

X Q. 44. Referring to the exhibit, White's Blueprint Diamond Mesh Measurements, and first to the first blueprint, am I correct in understanding that this is intended to illustrate the twenty-four and twenty-six gauge diamond mesh made according to the process of the patent in suit referred to in your answer to Q. 11?

A. Yes.

X Q. 45. The stretch which occurs in the process of the patent in suit and which is referred to in the claims of the patent, is that which takes place in the strands or bars connecting the uncut portions, is it not?

The question is objected to in so far as it calls for a legal interpretation of a portion of the claim of the patent in suit. As to this part, the question is not cross-examination, and the witness is
358 directed not to answer the remainder of the question.

Complainant's counsel objects to the objection, as it was made after the witness had answered the question affirmatively. The witness, may, however, consider the question without reference to the claim of the patent.

Defendant's counsel states in answer to the above statement that he asked that the question be read for the purpose of making the objection, before the same was wholly written down, and personally, he did not hear any answer given. It will be easy, however, for the witness to state the facts as to this, and whether he answered a part or the whole of the question, if he gave any answer at all.

A. Yes, the metal of the strand is undoubtedly stretched.

X Q. 46. Do you understand that there is any stretch in the uncut or connecting portions which unite the strand?

A. I think there is some stretch in the uncut portion uniting the strands, although not nearly so much as in the strands themselves.

X Q. 46. Is this stretch in the uncut portions indicated or represented in any of the blueprints which you have produced?

A. No. It is so small that it would be impossible to indicate it on the blueprints.

X Q. 48. And it need not be taken into consideration?

A. No.

X Q. 49. Now, referring to the first blueprint illustrating the diamond lath of the 24 and 26 gauge, it is true, is it not, that according to your diagram these uncut portions between the points *a* and *c* and *a*, *b*, *c* have a total length of one-half an inch?

A. Yes.

359 X Q. 50. The total length of the strand or portions which are subjected to stretching, is then, the difference between the points *a* and *c* before cutting less the uncut portion, or in other words one and 25/100 inches less 50/100 inches equals 75/100?

A. Practically all the stretching occurs in the two strands whose total original length was the .75 of an inch referred to.

X Q. 51. And after stretching, the length of these strands is the distance *a*, *b*, *c*, less the unstretched connection portions, or 1.30 inches minus .50 inch*es* equals .80 inch*es*. Is that correct?

A. This is approximately correct. In explanation I would say that the per cent. of stretch mentioned on the blueprints referred to is the average amount of stretch throughout the whole body of metal. Undoubtedly, there are parts of the metal stretched more than others, the same as in the case of a plain flat knife cutting a strand whose ends are rigidly attached, in which case practically all the stretching would occur near the ends of the knife, and while the average amount of stretch in the strand might be, for instance, four per cent. the portions of the metal near the ends of the knife will be stretched much more than this while the portions near the center of the knife will be stretched very slightly.

X Q. 52. As the patent in suit referred to certain stretching in the strands connecting the uncut portions, and as your blueprints attempt to show a percentage of stretching, I am afraid the Court might have been misled into the supposition that this was intended to represent the percentage of stretching of the strand. Now, is it not a fact that as the cut portions which form the strands were .75 inch*es* in length before stretching, and .80 inch*es* after stretching, the total amount of stretching is .05 inch*es*, which is not four per cent. but six and two-thirds per cent. of the original length of the strand. That is to say, is it not true, according to your own diagrams, that these strands forming the half mesh are stretched six and two-thirds per cent.?

360 A. The uncut portion of the metal, according to my understanding, forms an integral part of the strand, and I think the blue print makes it very clear that the original distance *a*, *c*, as measured on a straight line, becomes the distance *a*, *b*, *c*, as measured on a sinuous line, and that the increased length is as shown on the print. There are portions of this distance which are stretched more

than others, and should a very soft spot be encountered in the metal, this particular spot would be stretched more than any other section of the strand. I have seen cases where a soft spot has been stretched until it broke. I do not regard the original length of the strands forming the half diamond as three-quarters of an inch in length, but rather as an inch and a quarter.

X Q. 53. You will please confine your answer strictly to those portions of the metal which form the strands which extend from one uncut portion to another uncut portion, and eliminate entirely the uncut portions as forming any part of the strands. With this understanding, it is not true that these strands, according to your diagram of the 24 and 26 gauge diamond lath, are stretched six and two-thirds per cent.?

Objected to, for the previous answer made the matter entirely clear, the difference being simply one as to the definition of strand. If an answer is desired on a particular set of assumptions stated in the present question, the witness may answer on this particular assumption, even if opposed to his idea of "strand."

A. Accepting Mr. Hunter's definition of "strand," I answer yes.

Adjourned until Friday, May 11, 1906, at 10:15 A. M.

361 FRIDAY, *May* 11, 1906.

Met pursuant to adjournment.
Present as before.

Cross-examination of Mr. WHITE continued:

X Q. 54. In estimating the amount of stretch in the production of expanded metal by the process of the patent in suit, the percentage is materially smaller, if the comparison between the stretched and unstretched metal is made to include the uncut portions, than it would be if the comparison was instituted merely between the cut portions before and after cutting. Is not that correct?

A. The percentage of stretch when based upon a complete unit is materially less than when based upon the most stretched part of the unit.

X Q. 55. I understand your answer to mean yes?

A. Based upon your assumption of the meaning of "strand," my answer is yes.

X Q. 56. And the percentages of stretching given in all of the blueprints you have produced are based upon the comparison of the total length, including the uncut portions before and after cutting?

A. The percentages of stretch on all the blueprints which I have produced are based upon the total elongation of the complete units.

X Q. 57. Is your answer affirmative or negative to my question?

Objected to, for the witness has the right to answer the questions in his own way. If he considers that the question cannot be answered by simply yes or no, he can make his own statement.

A. The percentages of stretch on all the blueprints which I have produced are based upon the original length of metal in one 362 complete unit, that is, from *a* to *c*, as measured on a straight line compared with the final length of the same unit as measured on the sinuous line *a*, *b*, *c*.

X Q. 58. And includes the uncut portions?

A. The complete units are included.

X Q. 59. Do you mean by this that you include the uncut portions?

A. There is, to my mind, really no uncut portion in the finished sheet. There are portions where two meshes join where the cutting is not as close as in other places. If this place is what you mean by the "uncut portion," my answer is yes.

X Q. 60. Do you consider this a fair way of estimating the percentage of stretch at this place in the strand?

A. I certainly do. I know of no better way of estimating the stretch than to take one complete unit, many of which go to make up the completed sheet. The percentage of stretch varies in different parts of the unit, and I can see no reason why one part should be taken in preference to another.

X Q. 61. In giving an example of the amount of stretch which might be present in metal produced by the method of patent 320,242, you have said that with metal one-eighth inch thick making a cut six inches long, the stretch would be approximately four per cent. Did you in reaching this percentage base it upon the original length of metal in one complete unit measured on a straight line, compared with the final length of the same unit as measured on the sinuous line and including the uncut portion; or did you base it merely upon the cut strand?

A. I based my calculation upon the complete unit.

X Q. 62. Will you please repeat your calculation upon the record so that the Court may be informed as to how you reached this percentage?

The question is objected to as being an interruption in the 363 midst of an answer which the witness states he had not completed.

Counsel for complainant was not aware that the witness had not completed his answer, and apologizes for the interruption, which was unintentional, and he requests the witness to complete his answer to the preceding question.

(Witness continues)—In complete answer to X Q. 61, I would say, I based my calculations upon the complete unit, but the figure given, four per cent., was given as an approximate figure only, in fact all of the figures given are approximate only. If Mr. Hunter wishes the figures computed more accurately, allowing for a complete length of unit as something more than the even six inches, it can very readily be done. The allowance for slight errors due to the curved corner of the cutter cannot very well be taken into account in a paper calculation.

X Q. 63. But, as I understand the figures which you have given, whether correct or not, you have said that with a cut six inches long this stretch would be one-quarter inch, or approximately four per cent., and it seems to me that four per cent. is approximately the percentage of one-quarter inch to six inches, and that your calculation of the percentage is based wholly upon the stretch in the cut strand, and does not take into consideration the uncut portions at the ends of the strand, or the portions connecting the strands with other strands, and as you say that you have taken those portions into consideration in reaching the percentage which you have given in your answer to Q. 10, I would ask you, for the information of the Court, to repeat the calculation you made when you reached this result?

A. My calculation that the amount of elongation in the case cited was about four per cent. was a mental calculation, and in
364 figuring it I took into consideration that the total length of metal on which the elongation must be computed would be a trifle more than six inches. I think I have made it clear that the statement of four per cent. was an approximate one. In expanded metal having cuts six inches long, the junctions are so short as to bear a very small relation to the total length of the unit, and would not seriously affect the computation.

X Q. 64. In answer to Q. 23 you have stated that the stretching in the lath shown in the Ohl patent is about fourteen per cent. Will you please explain how you reached this result?

A. The amount of stretch as stated in the Ohl patent was computed from a rough measurement of the original length of the unit as shown on the patent drawings as compared with the finished length of the unit. The measurements on a drawing of this kind do not purport to be exact, but I believe them to be approximately correct.

X Q. 65. And of course you included the uncut portions in your unit, as you did in the case of the calculations in the blueprints you have produced?

A. The calculations were all made on the same basis.

X Q. 66. Now, will you please repeat upon the record the calculations based upon the drawings of the Ohl patent by which you reached the conclusions expressed in your answer to Q. 23?

A. I have not at hand my original measurements of the drawings in the Ohl patent, hence it is impossible to reproduce the computation. As I measured it I found that the distance beginning at the end of one cut measured around the loop and on to the near end of the next cut in the same row of loops was about fourteen per cent. greater than the distance measured between the same two points in a straight line.

X Q. 67. I now hand you a copy of the Ohl patent, the (witness states that he has not finished his last answer) same being
365 the exhibit copy in this case, and ask you to make the measurements and state upon the record what they are.

Defendant's counsel asks complainant's counsel whether he wishes to have the previous answer completed before putting the succeeding question, which certainly interrupted the witness and which seems to serve no good purpose in curtailing the answer.

Whereupon witness continues:

In further answer to X Q. 66, the figures throughout this computation have been mentioned as approximate, and they were made without any apparatus at hand for taking exact measurements. The statement that the elongation was about 14 per cent. was made with the idea of conveying the impression that the stretch was more than nominal, and in fact apparently more than in any of the samples which I have seen made by the machine of the patent in suit.

X Q. 68. Now, will you please again make the measurements as you did before, and state upon the record what they are?

A. The measurement as I measure it now with an ordinary rule, measured around the loop from one end of the cut and to the corresponding end of the next cut, measures one and one half inches, while the straight line distance from one end of the cut to the corresponding end of the next cut measures about one and five-sixteenths inches, the difference being three-sixteenths of an inch, which is about 14 per cent. of one and five-sixteenths inches, which was the original length of the metal in the unit. I find the original length of the metal in the loop itself to be about thirteen-sixteenths of an inch, and the finished length of the loop about one inch, showing a stretch in the loop itself of three-sixteenths of an inch, 366 or about 23 per cent. of the original length of the metal in the loop itself which was thirteen-sixteenths of an inch.

Cross-examination closed.

By Mr. BINNEY:

R. D. Q. 69. I notice you selected one-eighth of an inch in thickness in calculating the stretch of such metal under patent 320,242. Is there any reason why you selected that particular thickness?

A. Only because one-eighth of an inch is about the thickness of No. 10 gauge material, which is most used for reinforcing concrete.

R. D. Q. 70. In comparing the stretch of the strands of various laths and the like, by excluding from your calculations the portions that are either uncut or of double width, the per cent. of stretch is in each instance that you have given, slightly greater than when the entire unit from one end of the mesh to the same end of the next mesh is considered, is it not?

A. Yes, and this apparent increase in per cent. of stretch will be more in the small meshes, where the junctions are comparatively long, than in the large meshes where the junctions, or so-called uncut portions, are very small as compared with the total length of the unit.

R. D. Q. 71. In the smallest mesh shown in your blueprints this difference in the basis of calculation as between comparing the stretch in an entire unit and the stretch of the metal from one end to the other of a given strand, is respectively four per cent. and six and two-thirds per cent., if I understand you correctly. Now please take the other extreme case of the largest and heaviest mesh shown in your blueprints, and state the amount of the percentage of stretch as calculated on the strand or length of metal, excluding the unsevered portion?

367 A. The same basis of calculation which showed a stretch of six and two-thirds per cent. of the smallest mesh, applied to the largest mesh will show a stretch of 12.7 per cent. It should be noted, however, that in the case of the largest mesh, the metal is much thicker, and is partially cut through at the point from which our measurements are taken in computing the larger percentage of stretch, and it must not be considered that the stretch in the other portions is entirely negligible, although it is small as compared with the balance of the unit.

By Mr. Hunter:

R. X Q. 72. What is the thickness of the plate 24 gauge?

A. As I remember the standard sheet table, it is about 40/1000 of an inch. Of course, I am not positive about this, as I do not carry the sheet table in my head.

Deposition closed.

HERBERT E. WHITE.

Attest:

GEORGE H. SONNEBORN,
[SEAL.] *Notary Public and Special Examiner.*

368 *Examiner's Certificate.*

State of New York,
County of New York, ss:

I, George H. Sonneborn, a notary public in and for the County and State aforesaid, and special examiner by consent of counsel, to take the testimony of witnesses on behalf of the defendant in the suit of The Expanded Metal Company *vs.* The General Fireproofing Company in the United States Circuit Court for the Northern District of Ohio, Eastern Division, do hereby certify that on the 4th of April and 10th and 11th of May, 1906, I was attended by Thos. W. Bakewell and Harold Binney, Esqs., of counsel for defendant, and Ernest Howard Hunter, Esq., of counsel for complainant, and by the witness, Herbert E. White; the said witness being of sound mind and lawful age, having by me been carefully examined, cautioned and sworn to testify to the truth, his deposition was taken by me; that the said deposition was read over by the witness before he signed the same. I further certify that the foregoing is a true, full and correct record of the proceedings had before me, and that I am not of counsel or related to either of the parties or otherwise interested in the event of this suit.

In testimony whereof, I have hereunto set my hand and affixed my notarial seal this 11th day of May, A. D. 1906.

[SEAL.] GEORGE H. SONNEBORN,
Notary Public and Special Examiner.

369 *Additional Testimony by Consent.*

Circuit Court of the United States, Northern District of Ohio, Eastern Division. In Equity.

Patent No. 527,242.

THE EXPANDED METAL CO.
vs.
THE GENERAL FIREPROOFING CO.

NEW YORK, *December* 10, 1906.

Met pursuant to agreement of counsel.

Present: Mr. E. H. Hunter, for Complainant; Mr. T. W. Bakewell, for Defendant.

Testimony of William H. Ham.

WILLIAM H. HAM, a witness called by the defendant, having been duly sworn, says as follows in answer to questions by Mr. Bakewell:

Q. 1. Please state your name, age, residence and occupation.

A. My name is William H. Ham, age, thirty-one years, residence, Youngstown, O.; civil engineer.

Q. 2. Are you in the employ of the defendant company?

A. Yes.

Q. 3. What scientific and technical experience have you had?

A. In 1897 I was graduated from the Scientific Department of Dartmouth College, the Engineering Branch of that department, received the degree of Bachelor of Science. I returned to the institution for a post graduate year in the Thayer School of Civil Engineering and received the degree of Civil Engineer in 1898. 370

For a part of two years following I was in the employ of the State of Massachusetts in charge of topographical surveying on boundary line work. I then became assistant engineer with the firm of Waring, Chapman and Farquahr, 874 Broadway, N. Y., on construction work in connection with sewer and other sanitary works, having been assistant engineer on the construction of sewers in Stockbridge, Mass., and resident engineer on the construction of sewers of Waycross, Ga., having full charge of this latter operation. After about two years with this company I became engineer of the New York Expanded Metal Co., having charge of all requirements in the New York office of their engineering works, including the design and sale of expanded metal and expanded metal lath. This position I held for two years, after which I associated myself with Tucker & Vinton, Inc., concrete engineers and contractors, which position I held until the 1st of May, this year. During my connection with Tucker & Vinton my work included estimating, designing and superintending construction. The 1st of May, this year, I entered the employ of the General Fireproofing Co., in charge of the reinforced concrete department as engineer.

Q. 4. Are you familiar with expanded metal mesh used for reinforcing concrete in the manufacture of which the strands are considerably stretched?

A. I am.

Q. 5. Are you familiar with this product as made by the defendant, and also with the product made by the Expanded Metal Co., the complainant?

A. I am, with both.

Q. 6. Will you state, as the result of your experience, whether the stretching to which the metal is subjected in its manufacture imparts any good property to the expanded metal, or whether it imparts injurious property which have to be corrected? Please state
371 the facts in this matter as you have become acquainted with
them in your experience?

A. The expanded metal which has not been annealed, as I have discovered by tests of a physical nature, is very brittle and would be dangerous to use, on account of the care which would have to be used in handling it, and the liability of breaks in the strands not being detected. I would therefore not use expanded metal for any purpose without the annealing process, as a result of my experience with this product.

Q. 7. Can you produce any sheets of expanded metal made by the defendant and illustrate with them the tests which you have mentioned?

A. I can.

Q. 8. Please do so and state the nature of the tests as you do so?

A. I produce a sheet of expanded metal of the standard three-inch mesh, made by the General Fireproofing Company, the gauge being approximately ten. The length of the mesh is approximately six inches, and width of the mesh slightly under three inches. One end of the sheet has not been annealed and one end of the sheet has been annealed. I attach to the annealed end a tag marked "Annealed end," and to the other end a tag marked "Unannealed end." The difference in the ends of the sheet is very marked and can be easily illustrated by this physical test. I break from end of the sheet, by a simple bending of my hands, the parts of the sheet, that being the unannealed end. The annealed end acts entirely different. It is very tough and does not break by this bending by hand.

Q. 9. Does the unannealed end of the sheet which you have produced represent the ordinary condition of the product of concrete reinforcement made by the defendant company before it is annealed?

A. It does.

372 Q. 10. And will you state whether the other end of the sheet represents the ordinary condition of the defendant's product for concrete reinforcement after it has been annealed?

A. It does.

Q. 11. Would this sheet, unannealed, be a useful and commercially salable product?

A. I would neither use it nor sell it.

Q. 12. Why?

A. Because of the uncertainty of the material.

Q. 13. What difficulties would that uncertainty produce?

A. The material in its use is subject to numerous hardships before it is actually installed in place, any one of which might endanger the strength of the material, and therefore make it unreliable.

Q. 14. To what kind of hardships do you refer, and what would be their effects on the metal?

A. Walking over the sheet by men handling the materials that go with the sheet, or even dropping the sheets in place, or even the load upon the sheet in cars might, and probably would, injure the material before it was actually put in place.

Q. 15. How would that injury appear?

A. It might not be apparent, or it might be apparent in slight cracks, or even a full break.

Q. 16. Do you know where the products of the New York Expanded Metal Co. was made during the time that you were with that company?

A. At Pittsburg, Penna., by Chess Bros.

Q. 17. And will you state whether the concrete reinforcement dealt in by the New York Expanded Metal Co. was or was not annealed?

A. To the best of my knowledge all of it was annealed.

Q. 18. Will you state whether the concrete reinforcement made by the defendant company, the General Fireproofing Co., is or is not annealed?

A. It is annealed.

373 Q. 19. Will you please produce two sheets of the defendant's expanded concrete reinforcement, one end annealed and the other unannealed, and produce a third identical sample to be handed to complainant's counsel.

A. I do so.

Defendant's counsel offers in evidence two of the samples just produced by the witness, one end being marked "Annealed" and the other "Unannealed," and they are marked "Defendant's Exhibit Defendant's Product before Annealing and after Annealing." The third sample is tendered to complainant's counsel.

Q. 20. What do the users of this concrete reinforcement call for and require, an annealed product or an unannealed product?

A. Wherever I have had the subject under discussion the distinct understanding was that the material would be annealed, as an example, one of the largest contractors in this city recently purchased 400,000 feet of this material, one of the conditions of the contract being that it should be annealed expanded metal. It became my duty to have charge of this sale.

Direct examination closed.

Cross-examination by Mr. HUNTER:

X Q. 21. This brittleness which you have illustrated in the sample sheets of expanded metal you produced is the result, is it not, of the stretching of the strands?

A. Apparently, yes.

X Q. 22. Does it not depend in degree upon the extent to which the strands are stretched? By that I mean are not the strands more brittle when they are stretched to a greater extent than they would be if they were less stretched?

374 A. I have no proof, but I should say it should be so.

X Q. 23. Have you ever seen any expanded metal made according to this process in which the strands were stretched to a substantially less extent than in the samples you have produced?

A. I have seen one sample only, that I remember.

X Q. 24. Did you ever make any tests with such metal, by that I mean metal stretched to a less extent than the samples which you have produced, to determine whether the strands were objectionally brittle?

A. I have never made any tests.

X Q. 25. Are you familiar with the expanded metal for concrete reinforcement that is made by the Northwestern Expanded Metal Co., of Chicago, or by the Canadian Expanded Metal Co., or by the New Expanded Metal Co., of London?

A. I never have seen their product to examine it.

X Q. 26. Your experience is limited to the metal made by the defendant and that made by Chess Bros., of Pittsburg?

A. My use of the metal has been with those two products.

X Q. 27. Have you made any tests to determine the relative tensile strength of the annealed and unannealed strands?

A. I have not.

X Q. 28. As this stretching of the strands produces brittleness which, in your opinion, renders the further operation of annealing necessary to render the article salable, would you not consider that a better and more salable sheet would be obtained if it were made without stretching in the strands, or at least, without material stretching the form of the sheet, otherwise being the same?

A. It would seem that if such a case could be obtained, there might be advantages.

X Q. 29. Have you ever seen such a metal as that? I
375 mean a metal similar to the sheets which you have produced,
but formed without stretching or material stretching of the
strands, made at the defendant's plant?

A. I have seen the product which I think you intend to describe, with very little stretching.

X Q. 30. Is that material sold by the defendant?

A. I am not entirely sure on that point.

X Q. 31. You have no knowledge of the sale of such material?

A. No, I have not.

WILLIAM HALE HAM.

Attest:

GEORGE H. SONNEBORN,

[SEAL.] *Notary Public and Special Examiner.*

Testimony of A. P. White.

A. P. White, a witness called by the defendant, having been duly sworn, says as follows in answer to questions by Mr. Bakewell:

Q. 1. Please state your name, age, residence and occupation?

A. Alexander P. White, age forty-three; occupation, vice-president of the General Fireproofing Co.; Caldwell, N. J.

Q. 2. How long have you been engaged in the manufacture of expanded metal, if at all, and what knowledge and experience have you acquired regarding the same?

A. I have been engaged in the manufacture of expanded metal for about ten years. Beginning first with the manufacture of a product known in the market as Atlas lath, which was expanded
about twenty per cent. as compared with the area of the
376 original blank. The production of this material led me, in
connection with my brother, Herbert B. White, to examine into the question of making material of a much larger percentage of expansion. The result was the production of what is now well known as the Herringbone Expanded Metal and the diamond mesh material, which latter is the subject of this litigation. During these ten years, with my brother Herbert, I have made a close study of the organization of machinery for the production of this kind of material; have also had occasion to make more or less study of the various patents relating to this art.

Q. 3. Have you read the patent in suit in this case, No. 527,242, granted to J. F. Golding?

A. I have.

Q. 4. Will you state whether, in your opinion, this patent, in the absence of any additional description of an organized machine, discloses any useful or valuable information in the manufacture of expanded metal?

A. The patent shows nothing that was not known in the art at the time of issue. It shows knives for cutting the metal, but no means of organizing these knives in an operating machine. At the start the specification lays down the proposition that the applicant is seeking, in the production of expanded metal, to avail himself of the ability of the metal to stretch. As a means of thus availing himself of the ability of the metal to stretch, the knives already referred to are shown. By their shape these knives are adapted to cut a figure of diamond form, the blade of the knife being in the form of a half diamond. With the knives there is also shown a bed-plate with a straight edge, adapted to co-operate as a lower cutting blade. The specification describes the steps which these knives are to take in the production of metal of the diamond expanded type, and these
steps are described and claimed as the method which the ap-
377 plicant wished to protect by a patent. The steps described
are identically the same steps of the so-called Golding machine employed in carrying out the so-called process of patent No. 320,242. In short, the patent discloses nothing of practical value

but the suggestion of the functions of these knives, but as the knives are not shown in connection with any mechanism for their control and operation, the patent is, in my judgment, nothing more than an idea that it would be desirable to stretch the metal at the time of cutting and bending it. At the time this patent was issued it was well known that metal could be cut and bent, and it was equally well known that it could be stretched in the same operation, if a machine could be organized to carry out this idea. As I have stated, the steps shown in patent No. 527,242 are the same for a machine as the steps of the machine employed in carrying out the so-called process of patent No. 320,242, with the addition that the idea of stretching is imported into the function of the knives. There is no new step, no new order of steps, no new arrangement of steps, and no new combination of steps, and hence the disclosures of this patent are valueless, or in fact they do not amount to disclosure. The steps of the machine used to carry out the so-called process described in patent No. 320,242 were, first, a stroke of a guillotine machine with a cross-head carrying cutting blades. These blades made incisions in the metal blank, then upon successive strokes made further incisions, opening out the metal at the time the incisions were made. These incisions or slits were made in alternate positions; that is to say, the cuts of the second row broke joints with the cuts of the first row; and the cuts of the third row broke joint with the cuts of the second row, and so on throughout the sheet. In the machine used to

378 carry out the so-called process of patent No. 320,242, the knives were arranged on the cross-head in step form, an arrangement which involved the feeding in of the sheet obliquely. In the machine employed to carry out the so-called process of the patent in suit, the knives were arranged without the over-lapping feature, and that is, the distinguishing difference between the operation of the two machines. Both simultaneously cut and opened out the metal forming the strand, and then made further cuts in alternate positions behind the first cut, and so on throughout the blank. As a result of the stepped arrangement of the knives in one machine, a portion of the metal being acted upon was free to move, and being free to move, it was difficult in the operation of the machine, especially when the knives were dull, to keep it under control. When, however, the knives were changed to make the cuts in a straight line instead of an oblique line, all the metal acted upon was kept firmly engaged by the knives until it passed beyond the sphere of influence of the machine, and hence there was no chance for it to become distorted and irregular; hence, the distinction between these two so-called processes was that the steps of the machine, although alike, were carried out by a better machine in the case of the so-called process of the patent in suit. Reverting to the knives shown in the patent in suit, I would call attention to the fact that there is no way of realizing their operative effects until there is a machine organized to operate them. Until we have such a machine, we have nothing more than the suggestion that it would be a good idea to use a knife of the form of a diamond and stretch the metal at the same time of cutting and bending. The organization of such a machine

is no simple and easy task. Means must be provided, not merely for actuating the knives, but also for either shifting the knives,
379 or shifting the sheet. Then some mechanism must also be provided for gripping the sheet and allowing it to move at the same time between each stroke of the knives. Then in addition mechanism must be provided for feeding the sheet in a particular way, and I should say that the mechanism shown in the former machine for the oblique feeding is not available for feeding the machine in question. All these different parts of mechanisms must be harnessed together in a harmoniously, co-operating machine. The movements must be all organized synchronously, and the absence of any such mechanism in the patent in suit makes it valueless, except as a suggestion.

All of the above answer is objected to for the reason that it is not in the nature of surrebuttal testimony, but is an attempt to reopen the defendant's case in chief. It is also objected to as incompetent, irrelevant and immaterial.

Cross-examination by Mr. HUNTER:

X Q. 5. Have you ever, before this, testified as an expert on questions of mechanics or patented inventions?

A. No.

X Q. 6. I understand that for ten years past you have been connected with the making of expanded metal, and that you are, at the present time, the vice-president of the company.

A. Yes.

X Q. 7. What training in mechanics did you have prior to becoming interested in the making of expanded metal ten years ago?

A. No practical training prior to ten years ago, although I always made more or less of a study of mechanics.

X Q. 8. What was your occupation prior to becoming interested with expanded metal?

380 A. I was dealer in gas-lighting devices.

X Q. 9. For yourself?

A. Associated with my brother.

X Q. 10. What was the business name?

A. Incandescent Burner Co., with offices in Brooklyn, N. Y.

X Q. 11. How long were you engaged in that business?

A. Six years.

X Q. 12. Before that what did you do?

A. An officer of the Philadelphia & Reading Railroad. Assistant to one of the vice-presidents and confidential agent of the president, A. A. McLeon.

X Q. 13. And previous to that?

A. I was a journalist.

X Q. 14. Will you explain how you came to be interested in this Atlas lath?

A. The idea of expanded metal having been called to my attention, I regarded it as a desirable business which would in time become an important industry, and hence, in connection with my brothers, I embarked in it.

X Q. 15. You have made a comparison of the method of making expanded metal by machines adapted to carry out the method described in the Golding and Durkee patent No. 320,242, and the method described in the patent in suit. Is it not the fact that, according to the method of patent No. 320,242 as carried out by the machine for practicing that method, each of the following operations or actions takes place: (1) The metal is fed obliquely to the cutter. (2) The metal is fed in one direction only. (3) The cuts are made in step form. (4) A whole mesh; by that I mean the complete opening is formed at one operation. (5) The metal is not stretched to any substantial or material or useful extent. (6) The cutting operations are commenced at one corner, and finished at the opposite oblique corner?

381 A. Before replying to that question, I will explain that the claim of the patent in suit is so indefinite that it doesn't make any difference whether its cuts are oblique, whether the feed is oblique, or whether the machine is actuated one way or another way; it will embrace the functions of any machine that first cuts, bends and stretches metal open in one operation, and then embraces alternate to the first cuts, slits, stretches and opens the metal so as to form the mesh. As an example of what I have in mind, I might state that this same plaintiff endeavored to maintain this idea in the suit against Bradford *et al.* tried in the Philadelphia Circuit, wherein a machine organized with rotary knives in step form was, by its functions, alleged to infringe the so-called claim of the patent in suit. That machine cut the metal obliquely, and because the cuts were made after one another successively across the sheet, the plaintiff endeavored to maintain that it infringed his idea, which was to stretch the metal. The underlying principle of all the patents or so called methods for the production of expanded metal is the making of the cuts in alternate position. That idea was first disclosed in the English provisional patent of Long, and reproduced in the Golding patent, and again reproduced in the so called patent in suit, with the addition of a mechanical function of stretching the metal. It is true that the machine employed for carrying out the so-called method of patent No. 320,242, the metal is fed obliquely to the cutter, but notwithstanding this oblique feeding, the machine makes cuts and opens out the metal, and then, back of these cuts, in places alternate to the first cut, it makes other cuts, opening out the cut portions of the metal at the same time stretching the metal somewhat, and thus forming expanded metal. Second, if you mean the presentation of the metal to the knives, the metal is fed in one
382 direction only in both machines. In the early machines the alternate position of the cuts was effected by the oblique feeding, and in the other or late machines, it was effected by either shifting the sheet laterally, or shifting the upper knives laterally. If machine organized to employ the knives shown in the patent in suit were so organized that the knives were to be shifted, then the sheet would also be fed only in one direction. Third, I have already

explained that the cuts were made in step form, but they were made in alternate position, back of one another throughout the sheet. Fourth, if you mean to say that the opening constitutes a whole mesh, my answer is no, for the very simple and obvious reason that a part of the diamond figure is still an uncut, integral part of the mesh.

Mr. HUNTER (interrupting): It is perfectly evident by my question that what I mean is the opening or hole. And I ask you with this understanding to answer this part of the question.

WITNESS (continuing): No, because the diamond mesh configuration is not complete until all the sides are cut away from the blank. Moreover, the claim of the patent in suit is not limited to the cutting of any portion of the mesh, but specifically says "the simultaneously slitting and bending portions of a sheet of metal in such manner as to stretch or elongate the bars connecting the slit portions, and then repeating the operation," which is precisely the thing which this machine in question does, except that by reason of the configuration of the knives, the stretching is not uniform in the machine employed to carry out the method described in patent No. 320,242. The above answers the fifth interrogative. The foregoing also answers the sixth interrogative.

383 So much of the answer as refers to the Bradford case, or anything that may or may not be contained in the record of that case is objected as incompetent.

X Q. 16. I understand from the foregoing answer that it is not the fact in the production of expanded metal in the manner described in this patent 320,242, complete meshes are formed upon each operation of the cutter, is that correct?

A. The answer to that is that a mesh is not complete until the four sides are made, and the machine in question did not make the four sides in one stroke.

X Q. 17. Then you don't agree with your expert, Mr. Julian Kennedy?

A. Mr. Kennedy did not say anything in conflict with what I have stated. He made an answer, while misunderstanding your question, but subsequently corrected himself, so that his view is not at all in conflict with mine. What I have said is plainly seen by reference to the cut shown in patent 320,242.

X Q. 18. I call your attention to the following in Mr. Kennedy's deposition:

"X Q. 28. Is it not the fact that in the production of expanded metal in the manner described in this patent 320,242, complete meshes are formed upon each operation of the cutter?

A. Yes. * * *

X Q. 31. And it is true that in the process described in the patent 320,242, any stroke of the knives forms a row of complete meshes and does not have anything to do with the production of either the preceding or succeeding row of complete meshes?

A. If by 'meshes' you mean the area of opening not occupied by metal, this is true. If by 'mesh' you mean the four strands bound in the vacant space, it is not true."

384 As it is perfectly clear from my question to you, as well as from my examination of Mr. Kennedy, that what I mean by a mesh is exactly what Mr. Kennedy understood, to wit: the whole or area of opening not occupied by metal. Do you or do you not agree with your expert?

A. Mr. Kennedy defines what he means by a mesh, and there is nothing in his answer that is inconsistent with mine.

X Q. 19. Then what Mr. Kennedy says is true, and you agree with him?

A. The effect of Mr. Kennedy's statement, if language means anything, is that the mesh is not complete until the four sides are cut away from the blank, and the four sides of the diamond are not cut away by a single stroke.

X Q. 20. Then you don't agree with Mr. Kennedy?

A. I didn't say that I didn't.

X Q. 21. Then you do agree with him?

A. My understanding of Mr. Kennedy's statement is that the mesh was not complete until the second stroke. I have conversed with Mr. Kennedy.

Mr. Hunter (interrupting): I object to your stating any conversation you had with Mr. Kennedy as manifestly improper.

X Q. 22. Is it not the fact that in the production of expanded metal in the manner described in this patent 320,242 complete diamond openings or holes are formed upon each operation of the cutter?

A. Owing to a difference in the form of the knives a greater part of the opening was made by the machine employed to carry out 320,242 than was made by the knives of the machine employed to carry out the patent in suit. That is the distinguishing difference over which all this controversy has been about. The same methods were used, the same steps, the same arrangement of steps, and

385 the same combination of steps, but there was this difference in the knives.

X Q. 23. Have you any objection to answering the question?

A. I think I have answered the question. Please bear in mind the fact that many of your questions are so framed that it is not possible to give a categorical reply.

X Q. 24. I call your attention to the fact that I am asking you some of the identical questions that I asked your expert, Mr. Julian Kennedy. To these questions he was able to give categorical replies, and had no difficulty whatever both in understanding them and in making his meaning perfectly clear and intelligible. Why is it that you cannot do so?

A. I think I have made my meaning clear, and I repeat it, that owing to a difference in the knives of the two machines in question, the knives of one machine made a relatively larger opening than the knives of the other machine.

X Q. 25. Is it not the fact that in the pr-duction of expanded metal according to the method of the suit, there is produced upon each operation of any cutter, a strand which constitutes one-half of the finished mesh, the other half of the mesh being produced by the formation of strands due to the action of the cutters on the next operation?

A. That would depend entirely upon the kind of machine that you employed to carry out this so-called method into whose functions you organize this so-called method. If you employed a machine with stepped knives, such as is shown in the machine employed to carry out patent No. 320,242, you would cut a much larger portion then one-half in the first operation; but I call your attention to the fact that the claim of the patent in suit is not limited to any specific portion.

X Q. 26. Then you do not agree with your expert, Julian Kennedy, in this respect?

386 A. I have never heard Mr. Kennedy say anything that was in conflict with my statement.

X Q. 27. Then you consider it possible, in the practice of the method described in the patent in suit, to produce a complete mesh, or a complete diamond opening at one operation of the cutter?

A. If you consider the area embraced between the strand as the mesh, I do; but I want to add that I can't bring myself to understand that a mesh is complete until all parts are cut away from the blank.

X Q. 28. Then you do not agree with your expert, Mr. Julian Kennedy, when he testifies as follows:

"X Q. 23. And it is impossible, is it not, in the practice of the method described in the patent in suit, to produce a complete mesh by any one operation of the cutters?

A. Yes."

A. My answer to that is that Mr. Kennedy made the same differentiation between a mesh and a hole as I have just made. I do not agree with that fragment of Mr. Kennedy's testimony, because it does not convey the full meaning of Mr. Kennedy's testimony.

X Q. 29. Do I understand you to say that all of the opening is not made on each operation of the cutters in the method of patent No. 320,242?

A. If you speak of the area to be embraced within the four sides of the diamond, then that much area is complete in the first stroke; but the diamond is not finished until the second stroke is made, because in my conception of a diamond, that it is not a diamond until it has four outsides.

X Q. 30. Do you mean to say that a thing is not a diamond when it is bound by four insides, or bounding edges of metal?

387 A. It is a diamond, if we consider the mere area, but we are talking of the units that make up a sheet of expanded metal. Now these units are not complete until they are enclosed with four strands, and they are not enclosed with four strands until this machine has made the second stroke.

X Q. 31. I think the trouble in making intelligible answers to my questions is due to the fact that you persist in giving to my questions a meaning which I had repeatedly told you I did not intend. I have been asking you about a hole or opening; you have been answering about the strands of metal bounding that opening. Please understand that what I mean and have meant from the beginning of my cross-examination, and meant during my cross-examination of Mr. Kennedy, as he very clearly understood, is the hole or opening formed by the cutter. Now will you please go back to my X Q. 15, and answer whether it is not true that in the method described in the Golding & Durkee patent No. 320,242, a complete hole or opening is made at each operation of the cutter?

A. My answer is that by reason, not of any particular method, but by reason of the particular form of knife employed, the entire cut was finished so as to show a hole of diamond configuration, and I still maintain that this diamond is not complete as a unit of the sheet until the second stroke is made, although the area within the metal including the uncut portion, shows the figure of a diamond.

Adjourned until December 11, at 11 o'clock.

388 December 11, 1906.

Met pursuant to agreement.

Present—Counsel as before.

X Q. 32. Is your last answer intended to be affirmative or negative?

A. Negative or affirmative in respect to what question?

X Q. 33. In respect to the question asked of course?

A. If we are——

Counsel insists upon categorical answers to the questions which he puts. He appreciates the right of the witness to explain his answers and does not in any way wish to curtail that right or to make any of the answers doubtful in meaning. He calls attention to the fact that hardly a single answer that has been made by this witness with reference to the patent 320,242, is intelligible, and particularly the last answer, from which it is utterly impossible to understand what the witness means to say. If the witness persists in a refusal to make direct and intelligible answers, counsel gives notice that he will be compelled to apply to Court for an order to compel the witness to submit to proper examination or to have his deposition suppressed.

Will you please answer my question, which I now repeat: Is it not true that in the method described in the Golding and Durkee patent No. 320,242, a complete hole or opening is made at each operation of the cutter by a "complete" hole; I mean the entire opening which constitutes one of the openings of the finished sheet of expanded metal?

A. Yes, a complete opening of a part of a unit is made
389 by the use of the term "part of unit." I mean that only a
part of the mesh representing the units, many of which
make up a complete sheet, is produced. There is a diamond formed
hole shown, but one side of that hole is embraced in metal, which

is still integral with the blank and a finished unit of a completed expanded metal sheet, is not made until the second stroke.

X Q. 34. And in the production of expanded metal, according to the patent in suit, it is not true that the "complete hole" or opening is made at each operation of the cutter; is that so?

A. That would depend entirely upon the organization of the machine used to make the steps recited in patent in suit. I have said in a previous part of my testimony that there was no organized machine shown; no means, in fact, shown of achieving a practical result. If you refer to the use of a knife similar to the knife shown and co-operating with the bed-plate, then on each stroke of the knife the complete cut is made, the succeeding stroke making a cut in alternate position to the first, pushed the metal down, thus finishing the unit in substantially the same way that the unit is finished by the other machine after the first stroke.

X Q. 35. I am not asking you with regard to the operation of any particular machine, but merely with reference to what is shown and described in the patent in suit. Is it not true that what is shown and described in that patent is a construction of metal in which but half of the complete hole or opening is made at each operation of any cutter. Please answer the question, yes or no?

A. A complete hole is made by each stroke of the knife, the second stroke completing the form of the diamond.

X Q. 36. What do you mean by a hole?

A. The foraminous part of the mesh.

X Q. 37. Then do you mean to say that in the patent in suit each operation of a cutter forms the complete "foraminous part" of the finished expanded sheet? 390

A. If the particular cutters shown in the patent are employed it forms the complete cut, and the subsequent operation completely forms the foraminous part.

X Q. 38. And it does that by successive cuts and by the action of different cutters, and by successive operations. Is that so?

A. If that particular knife is employed, yes.

X Q. 39. And that is the way defendant's metal is made, is it not?

A. It is.

X Q. 40. I understand when you and your brother first became interested in metal of this general character you took up what was known as the Atlas lath. Was that the subject of a patent?

A. As originally made, it was.

X Q. 41. Will you give me the number and date of the patent or patents?

A. The patent was a patent to Dawson B. Hilton, of December 24, 1895, No. 551,766.

X Q. 42. And how long after you took up this Atlas lath was it that you took up the Herringbone?

A. I think we began working on the Herringbone idea in 1898 or 1899; to the best of my recollection about December, 1898.

X Q. 43. And when was it that you took up the diamond mesh material, similar to that which is involved in this suit?

A. A few months before the beginning of this suit.

X Q. 44. Did you and your brother start in the manufacture of the diamond mesh material yourselves?

A. We did not.

391 X Q. 45. Who was instrumental in organizing the General Fireproofing Co., the defendant?

A. The General Fireproofing Co. is the successor to the international Metal Lath Co., which was organized by myself and my brother. To the best of my recollection some time in 1899. Then the persons owning the International Co. organized the General Fireproofing Co. for the purpose of adding to the manufacture of lath and concrete reinforcement the manufacture of metallic furniture.

X Q. 46. Was it through your influence that the company engaged in the manufacture of the diamond mesh material?

A. I did not exert my influence to have it manufacture this particular kind of material.

X Q. 47. But you approved of it?

A. I did.

X Q. 48. Were you at that time aware that this kind of material was being manufactured and sold by certain companies claiming to have rights under the Golding patents?

A. We were aware that different companies were manufacturing this kind of material, but we were advised that the rights were dead.

X Q. 49. You were aware of the Golding & Durkee 1885 and 1888 patents on what has been called in this case Golding's old process?

A. We were, I think, aware of the existence of those particular patents, but we were advised that the material was not the subject of the patent any longer, because the original patent No. 297,382 has been held to be invalid. We were also advised that the other patents with which we might come in conflict were about expired, or would expire before we had the material on the market.

X Q. 50. You knew, then, that the process patent 320,242, and the machine patents 381,230, 381,321, and 320,241, had either expired
or were about to expire, and that you would be quite free to
392 make metal of this kind according to these patents without
liability for infringement? Is not that so?

A. I believe it is. And the fact is, we organized into a machine the same steps as are shown in these patents using in our machine a knife adapted to give the mesh the form of a perfect diamond. The patents referred to covering machines show an oblique feed for the metal, this oblique feed being adapted to meet the oblique arrangement of the knives. We simplified our machine by changing the feed, but the steps are substantially the steps shown in these machines, referred to by these patents.

X Q. 51. You are referring now to the process of making expanded metal practiced by your company, which we charge is the infringement in this case, are you?

A. I am referring to the steps of the machine.

X Q. 52. Which steps we allege constitute an infringement of the patent in suit, is that not so?

A. I believe that is your allegation.

Deposition closed.

A. P. WHITE.

Attest:

GEORGE H. SONNEBORN,
[SEAL.] *Notary Public and Special Examiner.*

393 & 394 *Examiner's Certificate.*

STATE OF NEW YORK,
County of New York, ss:

I, George H. Sonneborn, a notary public in and for the State aforesaid, and special examiner by consent of counsel, to take the testimony of witnesses on behalf of the defendant in the suit of The Expanded Metal Company *vs.* General Fireproofing Company, in the United States Circuit Court for the Northern District of Ohio, Eastern Division, do hereby certify that on the 10th and 11th days of December,1906, I was attended by Thomas W. Bakewell, Esq., of counsel for defendant and Ernest Howard Hunter, Esq., of counsel for complainant and by the witnesses William H. Ham and Alexander P. White; the said witnesses being of sound mind and lawful age, having by me been carefully examined, cautioned and sworn to testify to the truth, their depositions were taken by me; that the said depositions were read over by the witnesses before they signed the same. I further certify that the foregoing is a true, full and correct record of the proceedings had before me, and that I am not of counsel or related to either of the parties or otherwise interested in the event of this suit.

In testimony whereof, I have hereunto set my hand and affixed my notarial seal this 11th day of December, A. D. 1906.

GEORGE H. SONNEBORN,
[SEAL.] *Notary Public and Special Examiner.*

395 UNITED STATES OF AMERICA,
Northern District of Ohio, Eastern Division, ss:

Record of the proceedings of the Circuit Court of the United States within and for the Eastern Division of the Northern District of Ohio, in the cause and matter hereinafter state-, the same being disposed of at a regular term of said court begun and held at the city of Cleveland, in said District, on the first Tuesday of April, being the second day of said month, in the year of our Lord one thousand nine hundred and seven, and of the Independence of the United States of America the 131st, to-wit: on the twenty-fourth day of August, A. D. 1907.

Present: Honorable Robert W. Tayler United States District Judge.

No. 6657. Chancery.

THE EXPANDED METAL COMPANY
vs.
THE GENERAL FIREPROOFING COMPANY.

Said action was commenced on the 10th day of February, A. D. 1904, and proceeded to final disposition at the term and day above written, and during the progress thereof, pleadings and papers were filed, process was issued and returned, and orders of the court were made and entered in the order, and on the dates hereinafter stated, to-wit:

(*Subpœna in Chancery.*)

UNITED STATES OF AMERICA,
Northern District of Ohio, ss:

The President of the United States of America to the Marshal of the Northern District of Ohio, Greeting:

You are hereby commanded to summon the General Fireproofing Company, a citizen of and resident in the State of Ohio, if it be found in your District, to be and appear in the Circuit Court of the United States for the Northern District of Ohio, aforesaid, at Cleveland, on the first Monday in April next, to answer a certain Bill in Chancery, filed and exhibited in said court, against it by The Expanded Metal Co., a citizen of and resident in the State of Missouri.

Hereof you are not to fail under the penalty of the law thence ensuing.

And have you then and there this writ:

Witness, the Honorable Melville W. Fuller, Chief Justice of the United States, this 10th day of February, A. D. 1904, and in the 128th year of the Independence of the United States of America.

[SEAL.] IRVIN BELFORD, *Clerk,*
By B. C. MILLER, *Deputy Clerk.*

396 *Memorandum.*

The said defendant is required to enter its appearance in this suit in the clerk's office of said court on or before the first Monday of March, 1904, otherwise the said bill may be taken *pro confesso.*

IRVIN BELFORD, *Clerk.*

(Endorsements, when issued:) United States Circuit Court, Northern District of Ohio. No. 6657. The Expanded Metal Co. *vs.* The General Fireproofing Company. Subpœna in Chancery. Appearance day, first Monday in March, 1904. Answer day, first Monday in April, 1904. Munday, Evarts & Adcock, Complainant's Attorneys, 204 Dearborn St., Chicago, Ill.

(Endorsements, when returned:) $50.00 deposited in lieu of other security for costs for which the plaintiff may be liable in this suit. Irvin Belford, Clerk.

THE UNITED STATES OF AMERICA,
Northern District of Ohio, ss:

United States Marshal's Return.

Received this writ at Cleveland, Ohio, on February 10, 1904, and on February 11, 1904, at Youngstown, Ohio, I served the same on the within named The General Fireproofing Company by handing a true and certified copy hereof with all endorsements thereon, to W. A. Kingsley, general manager of said The General Fireproofing Company, the president, chairman of the board of directors or trustees, cashier, secretary, treasurer, clerk or other chief officer of said The General Fireproofing Company could not be found in my district.

F. M. CHANDLER,
United States Marshal.

Service,	$2.00
Travel,	4.26
Total	$6.26

By P. D. SAMPSELL, *Deputy.*

Returned and filed, February 12, 1904. Irvin Belford Clerk, United States Circuit Court, Northern District of Ohio.

(*Appearance of Defendant.*)

United States Circuit Court, Northern District of Ohio, Eastern Division.

Mr. Irvin Belford.

SIR: In the matter of the suit of The Expanded Metal Company *vs.* The General Fireproofing Co., please enter our appearance for the General Fireproofing Co., as of March 7, 1904, the first Monday in March.

397 Respectfully,

DICKERSON, BROWN,
RAEGNER & BINNEY,
Attorneys for General Fireproofing Co.

(*Order of Continuance.*)

February Term, A. D. 1904, to-wit: April 4, 1904.

Present: Honorable Francis J. Wing, United States District Judge.

Chancery. 6657.

THE EXPANDED METAL COMPANY
vs.
THE GENERAL FIREPROOFING COMPANY.

This cause is continued to the next term of this court.

(*Demurrer.*)

Circuit Court of the United States, Northern District of Ohio.

THE EXPANDED METAL COMPANY
vs.
THE GENERAL FIREPROOFING COMPANY.

In Equity on United States Patent No. 527,242.

This defendant, by protestation, not confessing or acknowledging all or any of the matters and things in the said Bill of Complaint herein to be true in manner and form as the same are therein set forth and alleged, does demur thereto and for causes of demurrer respectfully says:

I. That the said Bill of Complaint herein does not state any such cause of action as doth or ought to entitle the said complainant to any relief in this court, against this defendant, such as is prayed in the Bill of Complaint.

II. That it appears upon the face of United States Patent No. 527,242, granted October 9, 1894, to J. F. Golding, of which profert is made in the said Bill of Complaint, and a copy of which is attached to said Bill of Complaint as "Exhibit A," that the matter covered by the said Letters Patent is not a patentable invention.

III. That it appears upon the face of the said patent No. 527,242, of which profert is made in the said Bill of Complaint, and a copy of which is attached to said Bill of Complaint as "Exhibit A," that the claim of the said Letters Patent is not distinct.

IV. That it appears upon the face of the said patent No. 527,242, of which profert is made in the said Bill of Complaint, and a copy of which is attached to said Bill of Complaint as "Exhibit A," that the claim of the said Letters Patent covers nothing more than the necessary or obvious manner of effecting the production of the article and therefore does not cover a new and useful art or method of making open or reticuled metal work, as the claim purports to read.

398 V. And that it appears upon the face of the said patent No. 527,242 of which profert is made in the said Bill of Complaint, and a Copy of which is attached to said Bill of Complaint as "Exhibit A," that while the claim of the said Letters Patent on its face purports to cover an improvement in the statutory class of invention of a new and useful art, the alleged invention of the patent, if any, relates in fact to the statutory class of a manufacture, which is not claimed.

Wherefore and for divers other good causes of demurrer appearing in the said Bill, this defendant demurs thereto and humbly demands the judgment of this court whether it shall be compelled to make any further or other answer to said Bill of Complaint, and prays to be hence dismissed, with its costs and charges in this behalf most wrongfully sustained.

DICKERSON, BROWN,
RAEGENER & BINNEY,
Solicitors for Defendant.

I hereby certify that in my opinion the foregoing demurrer is well founded in point of law.

HAROLD BINNEY,
Of Counsel for Defendant.

UNITED STATES OF AMERICA,
Southern District of New York,
County of New York, ss:

Alexander P. White being duly sworn, deposes and says that he is the vice president of the General Fireproofing Company, the above-named defendant, and that the foregoing demurrer is not interposed for delay.

[CORPORATION SEAL.] ALEXANDER P. WHITE.

Sworn to and subscribed before me this 21st day of April, 1904.

[SEAL.] CAROLINE BAHR,
Notary Public, Notary Public, *Kings County, New York.*

Certificate filed in New York County.

(Endorsements:) No. 6657. Circuit Court of the United States, Northern District of Ohio. In Equity on United States Letters Patent No. 527,242. The Expanded Metal Company *vs.* The General Fireproofing Company. Demurrer. Dickerson, Brown, Raegener & Binney, 141 Broadway, New York. Solicitors for defendant. Filed May 2, 1904. Irvin Belford, Clerk.

(*Motion.*)

Circuit Court of the United States, Northern District of Ohio, Eastern Division.

No. 6657. In Equity.

THE EXPANDED METAL COMPANY
vs.
THE GENERAL FIREPROOFING COMPANY.

399 Now comes the complainant in the above entitled caus, and moves the court to set down for argument the demurre filed by defendant herein.

MUNDAY, EVARTS & ADCOCK,
Solicitors for Complainant.

(Endorsements on Motion:) 6657. The Expanded Metal Co. v General Fireproofing Co. Motion to set demurrer down for hearing. Filed May 7, 1904, Irvin Belford, clerk, United States Circuit Court, N. D. O.

(Demurrer Overruled.)

April Term, A. D. 1904, to-wit: June 4, 1904.

Present: Honorable Francis J. Wing, United States District Judg

6657. Chancery.

THE EXPANDED METAL COMPANY
vs.
THE GENERAL FIREPROOFING COMPANY.

This day this cause came on to be heard upon the demurrer t the bill of complaint and was argued by counsel. And the court being fully advised in the premises overruled said demurrer, and upon applicati-n of defendant by its attorneys leave is granted to i to answer by July rule day.

(Order of Continuance.)

April Term, A. D. 1904, to-wit: September 30, 1904.

Present: Honorable Francis J. Wing, United States District Judge.

No. 6657. Chancery.

THE EXPANDED METAL COMPANY
vs.
THE GENERAL FIREPROOFING COMPANY.

This cause is continued to the next term of this court.

(Order of Continuance.)

October Term, A. D. 1904, to-wit: January 31, 1905.

Present: Honorable Francis J. Wing, United States District Judge.

No. 6657. Chancery.

THE EXPANDED METAL COMPANY
vs.
THE GENERAL FIREPROOFING COMPANY.

This cause is continued to the next term of this court.

(Affidavit of Harold Binney.)

Circuit Court of the United States, Northern District of Ohio. In Equity.

THE EXPANDED METAL COMPANY
vs.
THE GENERAL FIREPROOFING COMPANY.

UNITED STATES OF AMERICA,
Southern District of New York, County of New York, ss:

Harold Binney, being sworn, says:

400 I am one of the solicitors and of counsel for the defendant in the above entitled cause. The bill of complaint herein was filed February 10, 1904; the replication was filed July 23, 1904. On August 17, 1904, Complainant commenced the taking of its *prima facie* proofs and continued the same at various times until August 20, 1904, when the last testimony herein was taken. At the close of the testimony on that day, complainant gave notice on the

record that its case was closed with certain exceptions and reservations. Since said date no further proceedings have been taken in this cause.

Defendant desires to put an end to the delay in this case and to take its proofs forthwith, but in order to do this, it should be assured that the *prima facie* proofs are definitely closed. I therefore request that an order be made directing the complainant to close its *prima facie* proofs within a reasonable time, and that the court also fix the time within which the proofs for defendant and rebuttal proofs shall be taken in order that this case may be in condition to be heard at an early date.

HAROLD BINNEY.

Sworn to before me this 1st day of April, 1905.

[L. S.] E. VAN ZANDT,
[SEAL.] *Notary Public, New York County, New York.*

(Endorsements:) United States Circuit Court, Northern District of Ohio. The Expanded Metal Co. *vs.* The General Fireproofing Co. Affidavit of Harold Binney. Filed April 3, 1905. Irvin Belford, clerk, United States Circuit Court, Northern District of Ohio.

(Order of Continuance.)

February Term, A. D. 1905, to-wit: April 3, 1905.

Present: Honorable Robert W. Tayler United States District Judge.

No. 6657. Chancery.

THE EXPANDED METAL COMPANY
vs.
THE GENERAL FIREPROOFING COMPANY.

This cause is continued to the next term of this court.

(Order of Continuance.)

April Term, A. D. 1905, to-wit: October 2, 1905.

Present: Honorable Robert W. Tayler United States District Judge.

No. 6657. Chancery.

THE EXPANDED METAL COMPANY
vs.
THE GENERAL FIREPROOFING COMPANY.

This cause is continued to the next term of this court.

401 *(Order of Continuance.)*

October Term, A. D. 1905, to-wit: February 5, 1906.

Present: Honorable Robert W. Tayler United States District Judge.

No. 6657. Chancery.

THE EXPANDED METAL COMPANY
vs.
THE GENERAL FIREPROOFING COMPANY.

This cause is continued to the next term of this court.

(Stipulation.)

United States Circuit Court, Northern District of Ohio, Eastern Division.

No. 6657. Chancery.

THE EXPANDED METAL COMPANY, Complainant,
vs.
GENERAL FIREPROOFING COMPANY, Defendant.

It is stipulated by and between counsel that the defendant shall have until April twentieth, 1906, to close its proofs in the above entitled cause, and the complainant thereafter shall have sixty days for rebuttal; further time to be granted only by order of court.
Dated February 27, 1906.

ERNEST HOWARD HUNTER,
Counsel for Complainant.
HAROLD BINNEY,
Counsel for Defendant.

(Endorsements:) 6657. The Expanded Metal Co. *vs.* General Fireproofing Co. Stipulation fixing time for taking proofs. Filed March 3, 1906, Irvin Belford, clerk, United States Circuit Court, Northern District of Ohio.

(Order of Continuance.)

February Term, A. D. 1906, to-wit: March 30, 1906.

Present: Honorable Robert W. Tayler United States District Judge.

No. 6657. In Equity.

THE EXPANDED METAL COMPANY
vs.
THE GENERAL FIREPROOFING COMPANY.

This cause is continued to the next term of this court.

(Order of Continuance.)

April Term, A. D., 1906, to-wit: October 1, 1906.

Present: Honorable Robert W. Tayler United States District Judge.

No. 6657. Chancery.

THE EXPANDED METAL COMPANY
vs.
THE GENERAL FIREPROOFING COMPANY.

This cause is continued to the next term of this court.

(Order of Continuance.)

October Term, A. D. 1906, to-wit: February 2, 1907.

Present: Honorable Robert W. Tayler United States District Judge.

The Expanded Metal Company,
vs.
The General Fireproofing Company.
} No. 6657.
Chancery.

This cause is continued to the next term of this court.

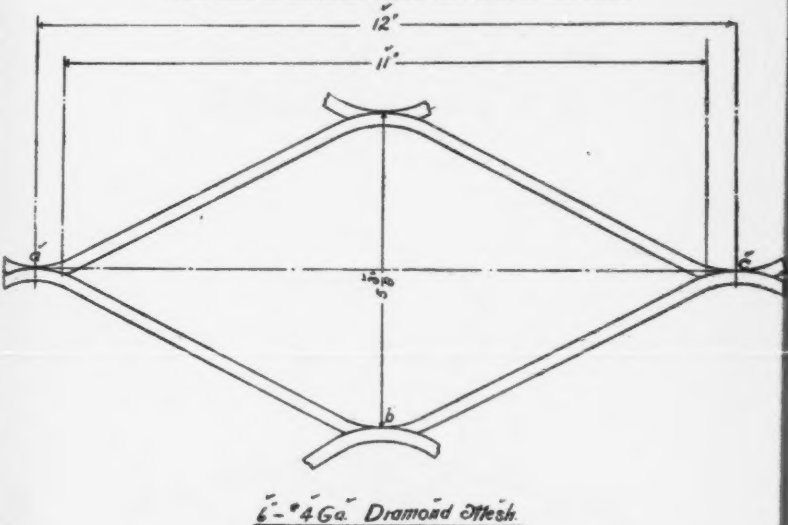
(Order of Continuance.)

February Term A. D. 1907, to-wit: April 1, 1907.

Present: Honorable Robert W. Tayler United States District Judge.

The Expanded Metal Company,
vs.
The General Fireproofing Company.
} No. 6657.
Chancery.

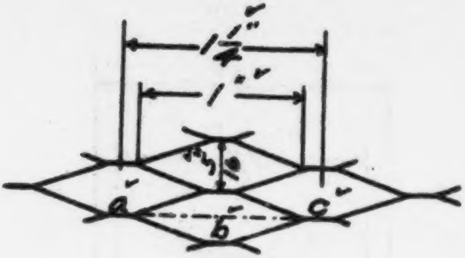
This cause is continued to the next term of this court.



6-#4 Ga. Diamond Mesh

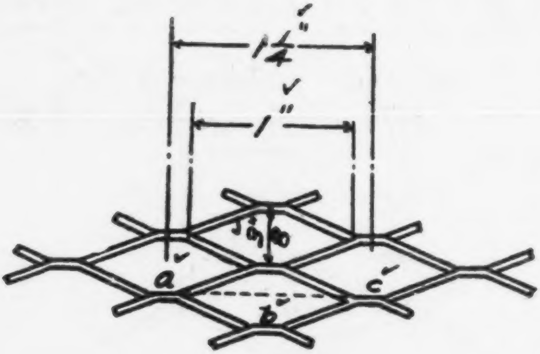
ac-12" abc-13.27"
Stretch-1.27"-10.6%

United States Circuit Court, Northern District of Ohio, Eastern Division, in Equity. The Expanded Metal Co. vs. General Fireproofing Co., defendants Exhibit White's Blue Prints Diamond mesh measurements. George H. Sonnieborn, Notary Public and Special Examiner. (Seal.) Filed March 26, 1907. Irvin Belford, Clerk U. S. Circuit Court, N. D. O.



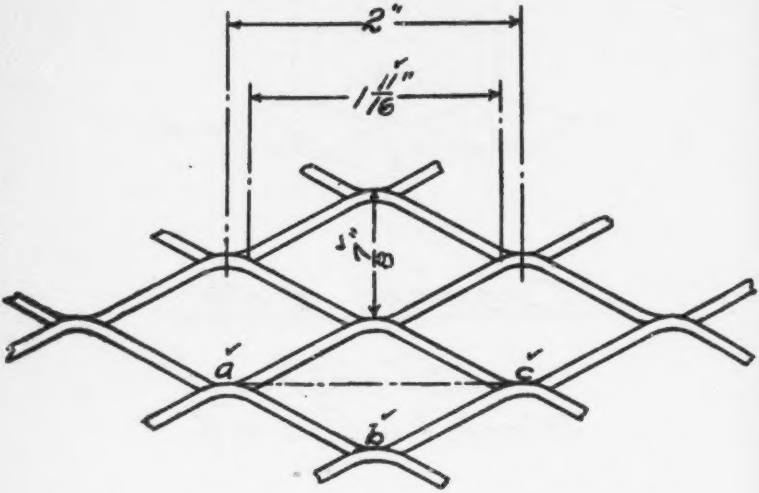
Diamond Lath.

ac = 1.25" ; abc - 1.30"
Stretch = .05" = 4%



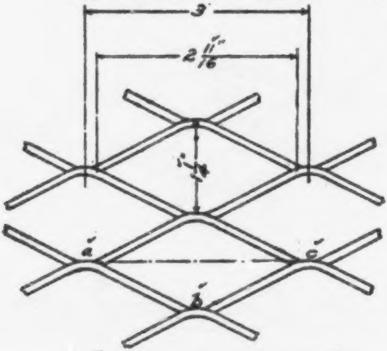
1/2" - #18 Ga. Diamond Mesh.

ac = 1.25" ; abc = 1.33"
Stretch = .08" = 6.4%


2"
1 11/16"
1 7/10"
a
b
c

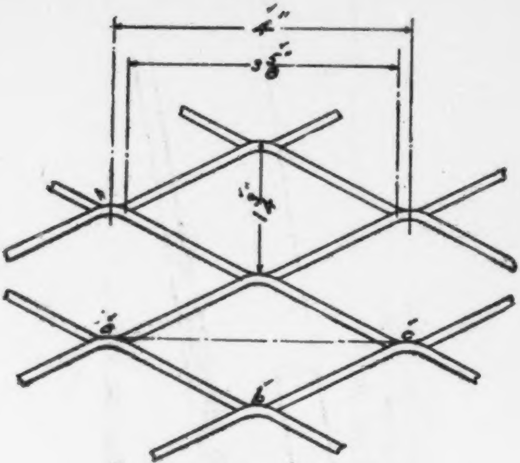
$\frac{3}{4}$" – #13 Ga. Diamond Mesh.

ac = 2" ; abc = 2.23"
Stretch = .23" = 11.5%



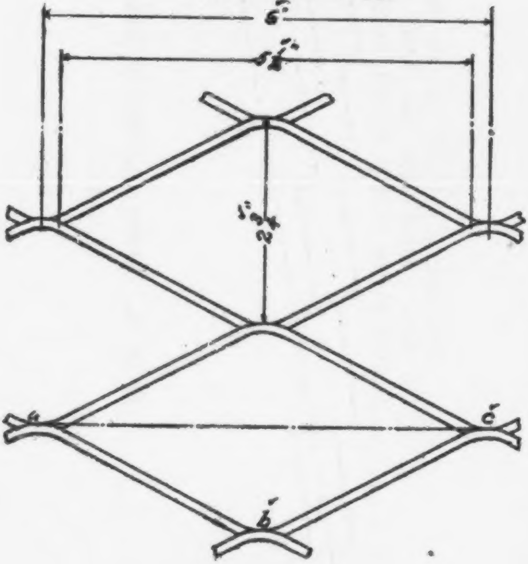
1½" – #12 Ga. Diamond Mesh.

ac = 3" ; abc = 3.29"
Stretch .29" = 9.67%


4"
3 5/8"
1 3/4"
a
a
b
c

2"-#12 Ga. Diamond Mesh.

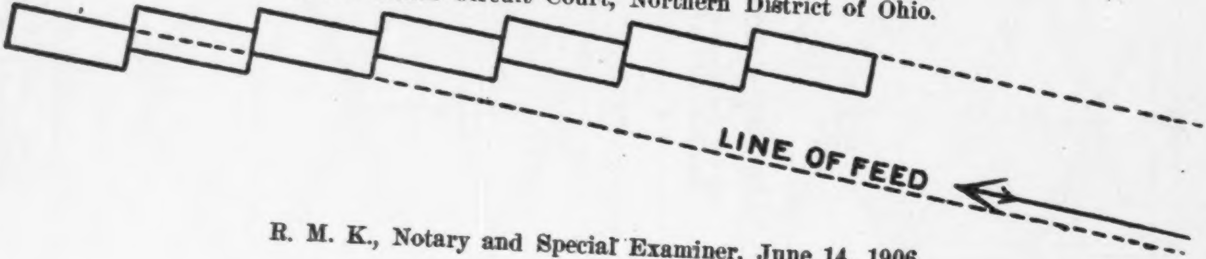
ac = 4" ; abc = 4.43"
Stretch = .43" = 10.7%


6"
5 5/8"
2 3/4"
a
b
c

3"-#10 Ga. Diamond Mesh.

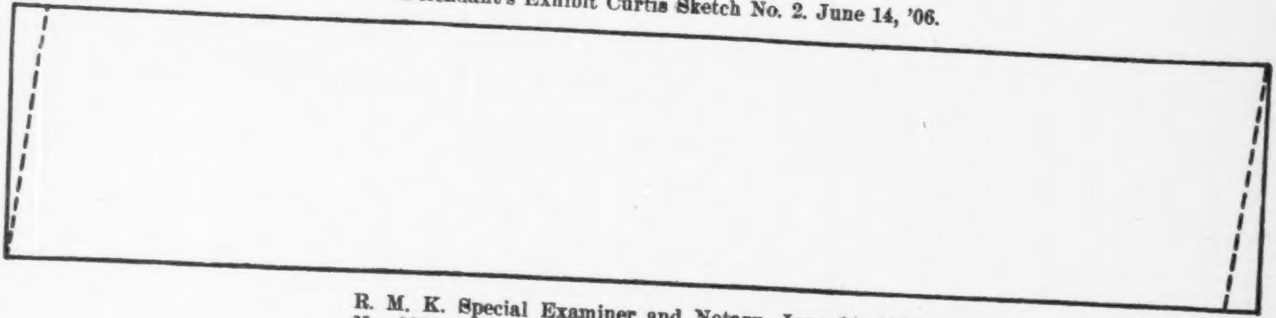
ac = 6" ; abc = 6.68"
Stretch = .68" = 11.3%

Defendant's Exhibit Curtis Sketch, June 14, 1906.
No. 6657. Filed May 18, 1907, Irvin Belford, Clerk,
United States Circuit Court, Northern District of Ohio.



R. M. K., Notary and Special Examiner, June 14, 1906.

Defendant's Exhibit Curtis Sketch No. 2. June 14, '06.



R. M. K. Special Examiner and Notary, June 14, 1906.
No. 6657. Filed May 18, 1907, Irvin Belford, Clerk,
United States Circuit Court, Northern District of Ohio.

408 *(Heard on Merits and Submitted.)*

April Term, A. D. 1907, to-wit: May 22, 1907.

Present: Honorable Robert W. Taylor, U. S. District Judge.

No. 6657. Chancery.

THE EXPANDED METAL COMPANY
vs.
THE GENERAL FIREPROOFING COMPANY.

This day this cause came on for final hearing on its merits and was argued by counsel and submitted to the court.

In the Circuit Court of the United States, Northern District of Ohio, Eastern Division.

No. 6657. In Equity.

THE EXPANDED METAL COMPANY, Complainant,
vs.
THE GENERAL FIREPROOFING COMPANY, Defendant.

Opinion of the Court.

TAYLER, *J.:*

The bill in this case charges the defendant with infringement of Patent No. 527,242 granted to John G. Golding, October 9, 1894, for a method of making expanded sheet metal. The claim of the patent is as follows:

"The herein described method of making open or reticulated metal work, which consists in simultaneously slitting and bending portions of a plate or sheet of metal in such manner as to stretch or elongate the bars connecting the slit portions and body of the sheet or plate, and then similarly slitting and bending in places alternate to the first-mentioned portions, thus producing the finished expanded sheet metal of the same length as that of the original sheet or plate, substantially as described."

The history of the art involved in the manufacture of expanded metal discloses a large number of patents and devices and shows constant and high development. The feature of the patent in suit which the complainant claims is involved is the stretching of the metal strands simultaneously with the act of cutting them from the body of the sheet. The patent is not for a machine, but is for a method. It seems to be merely the proclamation of an idea. The patentee later devised and obtained a patent for a machine suitably accomplishing the purpose.

The question of the validity of the patent in suit came up before the United States Circuit Court for the Eastern District of Pennsylvania where the patent was held to be valid, 136 Federal Reporter, 870. On appeal to the Circuit Court of Appeals the decision of the lower court was reversed and the patent held to be invalid. Bradford *et al. vs.* Expanded Metal Company, *et al.,* 146 Federal Reporter, page 984. The opinion in that case rendered by Judge Dallas seems

to me to correctly state the principles applicable to the facts
409 in this case and, with a reference to both cases for a statement of the facts, and to the reasoning of Judge Dallas for the grounds upon which my opinion is based, there is no necessity for anything further being said.

An order, may, therefore, be entered dismissing the bill.

R. W. TAYLER.

August 6, 1907.

(Endorsements on Opinion of the Court:) 6657. In the Circuit Court of the United States, Northern District of Ohio, Eastern Division. The Expanded Metal Company, Complainant, *vs.* The General Fireproofing Company, Defendant. Opinion of the court Filed August 6, 1907. Irvin Belford, clerk, U. S. Circuit Court, N. D. O.

(Decree.)

April Term, A. D. 1907, to-wit: August 24, 1907.

Present: Honorable Robert W. Tayler, U. S. District Judge.

No. 6657. Chancery.

THE EXPANDED METAL COMPANY
vs.
THE GENERAL FIREPROOFING COMPANY.

And now, this 24th day of August, 1907, the above case having come on for trial hearing on pleadings and proofs and having been argued by Ernest Howard Hunter, counsel for the complainant, and by Thomas W. Blakewell, counsel for the defendant, and the court being fully advised in the premises, it is ordered, adjudged and decreed,

That the bill of complaint be and the same hereby is dismissed and it is further ordered.

That the complaina-t pay to the defendant the costs of this suit to be taxed by the clerk and that the defendant have execution therefor.

(Petition for Appeal.)

In the Circuit Court of the United States, Northern District of Ohio, Eastern Division.

No. 6657. In Equity.

EXPANDED METAL COMPANY
vs.
GENERAL FIREPROOFING COMPANY.

Petition for Appeal.

And now this sixth day of November, 1907, comes the Expanded Metal Company, the complainant in the above entitled cause, by

its counsel, and considering itself aggrieved by the decree entered herein on the 24th day of August, 1907, whereby its bill of complaint was dismissed, petitions this court for an order allowing it to prosecute an appeal from the said decree dismissing its bill to the honorable the United States Circuit Court of Appeals for
410 the Sixth Circuit under and according to the laws of the United States in that behalf made and provided.

And your petitioner will ever pray.

ERNEST HOWARD HUNTER,
Of Counsel for Complainant.

Filed November 6, 1907.

IRVIN BELFORD,
Clerk, U. S. Circuit Court, N. D. O.

(Assignment of Errors.)

In the Circuit Court of the United States, Northern District of Ohio, Eastern Division.

No. 6657. In Equity.

EXPANDED METAL COMPANY
vs.
GENERAL FIREPROOFING COMPANY.

Assignment of Errors.

And now this sixth day of November, 1907, comes the Expanded Metal Company, complainant and appellant, and says that in the proceedings of the said court in the above entitled case and in the decree made and entered therein on the 24th day of August, 1907, there are manifest errors, to-wit:

1. The Circuit Court erred in holding the complainant's patent 527,242, dated October 9, 1904, invalid and directing the dismissal of the bill of complaint.
2. The Circuit Court erred in holding the complainant's patent valid and infringed by the method of making expanded metal practiced by the defendant, and in not directing a decree for an injunction and accounting.

Wherefore, the said complainant and appellant prays that the said decree dismissing the said bill of complaint be reversed.

ERNEST HOWARD HUNTER,
Of Counsel for Complainant-Appellant.

(Endorsements:) In the Circuit Court of the United States, Northern District of Ohio, Eastern Division, No. 6657. In Equity. Expanded Metal Company *vs.* General Fireproofing Company. Petition for Appeal, Assignment of Errors. Ernest Howard Hunter, 72-29 New York Mutual Life Building, 1011 Chestnut street, Philadelphia, Pa. Filed November 6, 1907. Irvin Belford, Clerk, U. S. Circuit Court, N. D. O.

(Order Allowing Appeal.)

October Term, A. D. 1907, to-wit: November 6, 1907.

Present: Honorable Robert W. Tayler, U. S. District Judge.

6657. Chancery.

EXPANDED METAL COMPANY
vs.
GENERAL FIREPROOFING COMPANY.

411 The Expanded Metal Company, the complainant in the above entitled cause, having presented and filed its petition for an order allowing an appeal to the United States Circuit Court of Appeals for the Sixth Circuit, from the decree dismissing the bill of complaint in the said cause, and having filed with said petition the assignment of errors:

Now, this 6th day of November, 1907, on motion of complainant's solicitor, it is

Ordered that an appeal to the United States Circuit Court of Appeals for the Sixth Circuit from the decree made on the 24th day of August, 1907, dismissing the bill of complain*ant* in the above cause, be and the same is hereby allowed; appeal bond to be entered in the sum of five hundred ($500.00) dollars, and upon the entry thereof, it is further ordered that a transcript of the record and proceedings in this court be certified to the said Circuit Court of Appeals according to law and a citation issued accordingly.

(Order Withdrawing Exhibits.)

October Term, A. D. 1907, to-wit: November 6, 1907.

Present: Honorable Robert W. Tayler, U. S. District Judge.

No. 6657. Chancery.

THE EXPANDED METAL COMPANY
vs.
THE GENERAL FIREPROOFING COMPANY.

It appearing to the court that "Defendant's Exhibit, Curtis Sketch," and "Defendant's Exhibit, Curtis Sketch No. 2," filed in this cause, cannot be conveniently duplicated, it is ordered that said exhibits be withdrawn from the files of this court and forwarded to the clerk of the United States Circuit Court of Appeals for the Sixth Circuit, with the transcript of record in this cause, for use at the hearing of this cause in said Circuit Court of Appeals.

(Bond on Appeal.)

Know all men by these presents, That we, The Expanded Metal Company, as principal, and The Empire State Surety Company of 34 Pine street, New York, as sureties, are held and firmly bound unto

The General Fireproofing Company in the full and just sum of five hundred dollars ($500.00) to be paid to the said The General Fireproofing Company, certain attorney, executors, administrators or assigns; to which payment well and truly to be made, we bind ourselves, our heirs, executors and administrators, jointly and severally by these presents. Sealed with our seals and dated this 2nd day of December, in the year of our Lord one thousand nine hundred and seven (1907).

412 Whereas, lately at a session of the United States Circuit Court for the Northern District of Ohio, Eastern Division, in a suit depending in said court, between The Expanded Metal Company and The General Fireproofing Company a decree was rendered against the said The Expanded Metal Company and the said The Expanded Metal Company having obtained an appeal and filed a copy thereof in the clerk's office of the said court to reverse the decree in the aforesaid suit, and a citation directed to the said The General Fireproofing Company citing and admonishing it to be and appear at a United States Circuit Court of Appeals for the Sixth Circuit, to be holden at the city of Cincinnati within thirty days.

Now, the condition of the above obligation is such that if the said The Expanded Metal Company shall prosecute it to effect, and answer all damages and costs if it fail to make its plea good, then the above obligation to be void; else to remain in full force and virtue.

EXPANDED METAL COMPANY,
By OSCAR BRADFORD, *President.*
THE EMPIRE STATE SURETY COMPANY.
HERMAN F. SCHWEFLER,
Acting Resident Vice President.
M. V. EAGAN,
Acting Resident Ass't. Secretary.
(CORPORATE SEAL.)

Sealed and delivered in the presence of
S. A. GEILFORD,
H. WINKELMAN.
DWALL SHUSTER, *As to Surety.*

Approved by
R. W. TAYLER, *District Judge.*

(Endorsements on Bond on Appeal:) 6657. The Expanded Metal Company *vs.* The General Fireproofing Company. Bond on Appeal. Filed December 5, 1907. Irvin Belford, Clerk, U. S. Circuit Court, N. D. O.

United States Circuit Court of Appeals for the Sixth Circuit.

UNITED STATES OF AMERICA,
Sixth Judicial Circuit, ss:

To The General Fireproofing Company or Dickerson, Brown, Raegener & Binney, its attorneys, Greeting:

You are hereby cited and admonished to be and appear at a session of the United States Circuit Court of Appeals for the Sixth Circuit, to be holden at the City of Cincinnati in said circuit, on the* 4th day of January next, pursuant to an appeal filed in the Clerk's office of the Circuit Court of the United States for the Northern District of Ohio, wherein The Expanded Metal Company is appellant and you are appellee to show cause, if any there be, why 413 & 414 the decree rendered against the said appellant as in the said appeal mentioned, should not be corrected and why speedy justice should not be done to the parties in that behalf.

Witness the Honorable Melville W. Fuller Chief Justice of the United States, this 5th day of December, in the year of our Lord one thousand nine hundred and seven, and of the Independence of the United States of America the one hundred and thirty-second.

R. W. TAYLER,
District Judge.

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*Not exceeding 30 days from day of signing.

Service of the above citation is hereby acknowledged and appearance of defendant is hereby entered.

THOMAS W. BAKEWELL.

December 17, 1907.

In the Circuit Court of the United States for the Northern District of Ohio, Eastern Division.

Chancery. No. 6657.

THE EXPANDED METAL COMPANY
vs.
THE GENERAL FIREPROOFING COMPANY.

NORTHERN DISTRICT OF OHIO, *ss:*

I, Irvin Belford, Clerk of the Circuit Court of the United States for said District, do hereby certify that the annexed and foregoing pages contain a full, true and complete copy of the final record, including the petition for allowance of appeal, assignment of errors, and all proceedings in said cause; and there is embraced in such record, a true copy of the opinion of the court therein filed and also the testimony, together with exhibits therein referred to, taken, used and filed, the originals of all which, except exhibits withdrawn by order of said court, remain in my custody as clerk of said court. There are also, herewith, sent original exhibits referred to in testimony and used in the hearing of said cause, and there is, also, attached hereto and transmitted herewith, the citation issued and allowed herein.

In testimony whereof, I have hereunto signed my name and affixed the seal of said court, at Cleveland, Ohio, in said district, on this 19th day of December, A. D., 1907, and in the 132d year of the Independence of the United States of America.

[SEAL.] IRVIN BELFORD, *Clerk,*
By A. H. ELLIOTT, *Deputy Clerk.*

[Second Edition.]

A.D. 1862, 26th July. N° 2125.

Manufacture of Open Metal Work.

(This Invention received Provisional Protection only.)

PROVISIONAL SPECIFICATION left by Thomas Long at the Office of the Commissioners of Patents, with his Petition, on the 26th July, 1862.

I, Thomas Long, of 2, Clarendon Place, Notting Hill, in the County of Middlesex, House Decorator, do hereby declare the nature of the said Invention for "IMPROVEMENTS IN THE MANUFACTURE OF OPEN METAL WORK APPLICABLE TO VARIOUS USEFUL PURPOSES," to be as follows, that is to say:—

This Invention relates to an improved manufacture of open metal work, or metal trellis or lattice work intended to be used as an economical substitute for ordinary wire netting or perforated metal, and applicable also to the manufacture of bird cages, basket stands, and supports for flowers, fire-guards, and other purposes where wire work has hitherto been employed.

According to this Invention, it is proposed to make open metal work, or trellis or latticework by making a number of slits in a flat sheet of metal, such slits being made in straight or curved lines or row, the slits in each line or row being made to break joint with the adjoining lines or rows, a small portion of the metal being left intact or uncut between the ends of the several slits. The sheet having been thus slit, is now stretched out so as to open the slits, whereupon a perfectly-formed trellis having hexagonal openings will be produced. In order to form a finish to, and strengthen the edges of this open metal work, it is proposed to turn up the edges of the plate before it is

[*Price*, 8*d*.]

stretched, and to insert therein a length of wire, which, when the metal is stretched, will remain threaded through each of the end tongues of the metal work. The slitting of the metal sheets may be effected either by suitable slitting rolls, stamping apparatus, or by hand cutters or tools, as preferred.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.
[G. 7838—25—3/1904.]

A.D. 1885. Sep. 23. Nº 11,332.
JOHNSON'S Complete Specification.

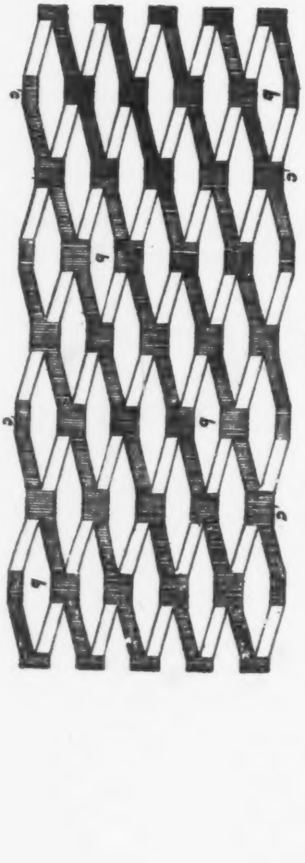
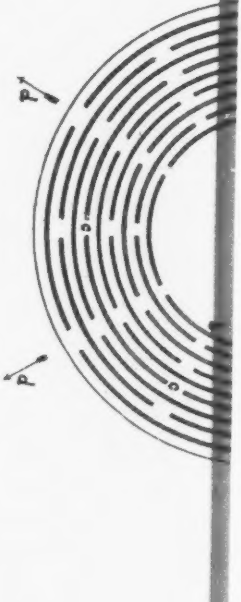


FIG. 2.



Lond
Printed

23. N° 11,332.
Specification.

No. 606
T. H. Co
v.
C. M. Co } p 417

417
(1 SHEET)

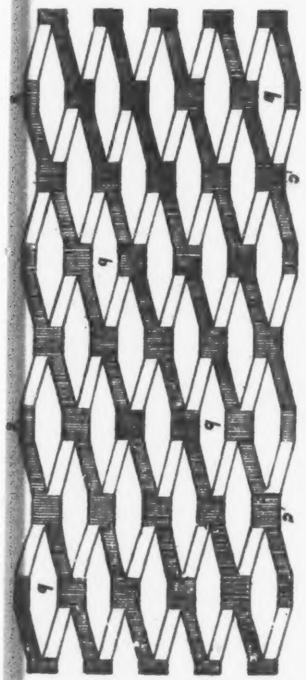


FIG. 2.

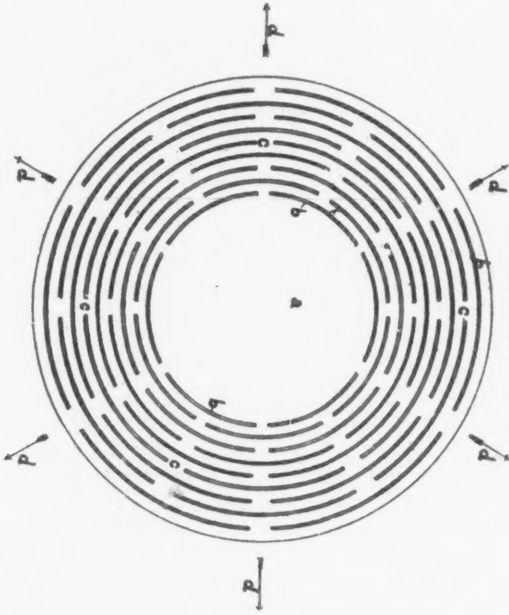

d
d
d
d
d
d
c
b
b
c
a
c
b
c

FIG. 3.

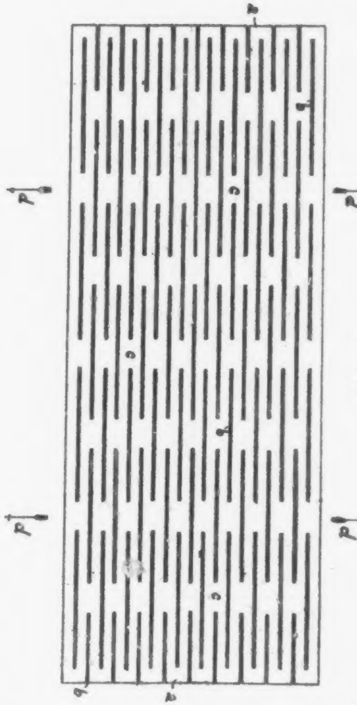

a
b
d
d
c
c
b
d
d
c
a
b

FIG. 1.

London. Printed by Eyre and Spottiswoode.
Printers to the Queen's most Excellent Majesty. 1885

Malby & Sons. Photo-Litho.

A.D. 1885, 23rd *September*. Nº 11,332.

PROVISIONAL SPECIFICATION.

[*Communicated from abroad by Florian Tentschert, of Mödling, Vienna, in the Empire of Austria, Engineer.*]

Improvements in the Manufacture of Open Metal Work for Use as Lattice Work, Trellis-work. Sieving, or the like.

I James Yate Johnson of 47 Lincoln's Inn Fields in the County of Middlesex Gentleman do hereby declare the nature of this Invention which has been communicated to me from abroad by Florian Tentschert of Mödling Vienna in the Kingdom of Austria Engineer to be as follows:—

This Invention has for its object to manufacture simply expeditiously and cheaply metal sheets into lattice work, trellis-work sieving or equivalent open metal work—According to this Invention a metal sheet is taken and at intervals rows or circles of slits or slots are formed the slits or slots of each row "breaking bond" with those of the adjacent row or rows—The plate is then pulled in a direction or directions transversely to the length of the slits or slots and over a suitable former or mould if desired and there is thus produced an open metal work suited to the purposes to which ordinary lattice work or woven or interlaced metal strips or wires are usually applied.

Dated this 23rd day of September 1885.

J. HENRY JOHNSON,
47, Lincoln's Inn Fields, London, W.C.

COMPLETE SPECIFICATION.

Improvements in the Manufacture of Open Metal Work for Use as Lattice Work, Trellis Work, Sieving, or the like.

I, James Yate Johnson of 47 Lincoln's Inn Fields in the County of Middlesex Gentleman do hereby declare the nature of this Invention which has been communicated to me from abroad by Florian Tentschert of Mödling Vienna in the Kingdom of Austria Engineer and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This Invention has for its object to manufacture simply expeditiously and cheaply metal sheets into lattice-work trellis-work sieving or equivalent open metal work—According to this Invention a metal sheet is taken and at intervals rows or circles of slits or slots are formed, the slits or slots of each row "breaking bond" with those of the adjacent row or rows—The plate is then pulled in a direction or directions transversely to the length of the slits or slots and over a suitable former or mould if desired and there is thus produced an open metal work suited to the purposes to which ordinary lattice work or woven or interlaced metal strips or wires are usually applied.

And in order that this Invention may be fully understood I shall now proceed to describe more particularly with reference to the accompanying drawing the manner in which the same may be performed. +

Figure 1 represents a metal sheet having longitudinal parallel slits formed therein ready to be stretched or pulled and opened out, and Figure 2 represents the same sheet after it has been stretched or pulled and opened out.

Figure 3 shows a circular sheet of metal provided with concentric slits ready to be pulled or stretched and opened out.

A sheet *a* of any suitable metal or alloy capable of being rolled, such for example as iron steel brass or the like and of the required thickness is taken and placed in a suitable machine or operated upon by a cutting or stamping instrument to produce therein parallel rows of slits or slots as shew at *b* in Figure 1 in such a manner that the full parts *c* of one row or range of slits are opposite to the slitted parts *b* of the adjacent row or rows as shewn in Figure 1—A slotting machine of any well known or suitable construction may be employed for making the slits in the plate *a*, care being taken that the slits of the several rows are arranged in the particular manner before described and shewn so that when the sheet is pulled stretched or opened out openings will be formed as shewn.

The sheet *a* thus slitted or slotted is then pulled or stretched in the direction of the arrows *d. d* that is to say transversely to the direction of the slits—The sheet *a* may be pulled or stretched either when cold or it may be heated before being stretched.

This pulling or stretching or opening out of the slits or slots may be effected by means of any suitable stretching apparatus such for example as a combination of pairs of blocks between which the opposite sides of plate are held the blocks being forced apart by screw or other power.

By stretching out the sheet a lattice work having hexagonal openings or meshes is formed as shown in Figure 2 and according to the size of the meshes the area of

+ Here follows diagram marked (p. 417)

the lattice or trellis work produced will be increased over that of the unstretched sheet or plate.

In the modification illustrated by Figure 3 the circular metal sheet *a* is provided with concentric rows of slits and is intended for use in making baskets or other articles of a cylindrical circular or conical form.

This may be effected in any convenient manner such as by stretching the sheet out on or over a form or model of the required shape by means of suitably arranged stretching mechanism as hereinbefore mentioned.

The length or size of the slits or slots and their distance from each other as well as the kind of metal and thickness of sheet employed may be varied according to the quality and purpose for which the article to be produced is to be used. Metal lattices or trellis work constructed as hereinbefore described may be advantageously employed in place of that hitherto made by netting or twisting metallic wires or by rivetting strips or bands of metal together by means of costly and complicated machinery.

Having now particularly described and ascertained the nature of this Invention and in what manner the same is to be performed I declare that what I claim is

1st The manufacture of open metal work for use as trellis-work lattice-work sieving or other purpose by slitting or slotting a plate or sheet of metal and afterwards pulling stretching or opening out the slitted or slotted sheet or plate substantially as hereinbefore described.

2nd Articles for use as trellis work, lattice work sieving or other purpose for which interlaced or interwoven strips are employed the said articles being made from slitted or slotted and stretched or opened out metal sheets or plates substantially as hereinbefore described.

3rd Articles of open metal work produced by slitting or slotting a metal plate or sheet and stretching and forming it over a shape or mould substantially as hereinbefore described.

Dated this 16th day of October 1885.

J. HENRY JOHNSON,
47, Lincoln's Inn Fields, London, W.C.

LONDON: Printed by Eyre and Spottiswoode,
Printers to the Queen's most Excellent Majesty,
For Her Majesty's Stationery Office.

1885.

No. 606
G. F. Co
Em. Co } p 421

421 J. W. Nesmith.

Machine for Punching Metal Screens.

No 91,333.

Patented Aug. 31, 1869.

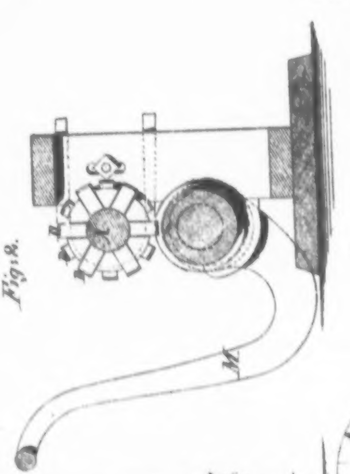


Fig. 2.

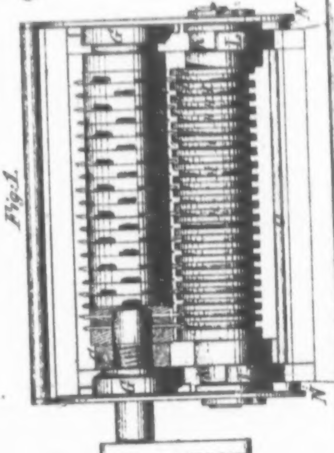


Fig. 1.

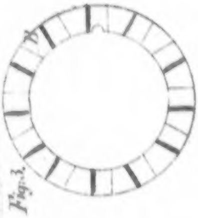


Fig. 3.

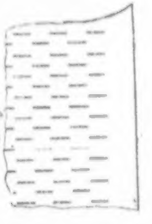


Fig. 4.

Witnesses:
[illegible]
Geo. W. Mabee

Inventor:
J. W. Nesmith
Per Munn & Co
Attorneys.

Un

J. Welli

IMP

s

To all who
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422

UNITED STATES PATENT OFFICE.

WELLINGTON NESMITH, OF BLACK HAWK, COLORADO TERRITORY.

IMPROVED MACHINE FOR PUNCHING METAL SCREENS.

Specification forming part of Letters Patent No. **94,333**, dated August 31, 1869.

ll whom it may concern:

e it known that I, J. WELLINGTON NE-
CH, of Black Hawk, in the county of Gil-
and Territory of Colorado, have invented
w and Improved Screen-Punching Ma-
e; and I do hereby declare that the fol-
ng is a full, clear, and exact description
eof, which will enable others skilled in
art to make and use the same, reference
g had to the accompanying drawings,
ing part of this specification.

he object of this invention is to provide a
le and efficient machine for punching
t metal to make screens, such as are used
creening ores and other substances.

he invention consists of improved ar-
gements of a punching-roller and grooved
r, between which the sheet is passed to
unched, whereby they may be varied to
ch finer or coarser holes, also whereby
sheet may be readily inserted and re-
ed, so as not to punch the border.

he said invention also consists in an im-
ved construction of the punching-roller. ✗

gure 1 represents a side elevation of my
roved machine. Fig. 2 represents a trans-
e section of the same. Fig. 3 represents
levation of one of the punch-holding
s of the punching-roller, and Fig. 4 rep-
nts a part of a sheet of metal as it appears
r punching.

milar letters of reference indicate corre-
ding parts.

he punch-carrying roller is composed of a
, A, and any preferred number of punch-
ing rings or disks, B, fitted to the said
, and clamped thereon against a collar
e end by a screw, C, or by other means
he other end. These rings have radial
or grooves in one side, for the reception
he punches D, which are short flat plates
pened at the ends, which project from the
r. The said ends project only sufficient
enetrate the sheets to be punched. They
enough thicker than the depth of the ra-
slots in the rings to be firmly clamped
the rings when screwed up. The jour-
of this roller are placed in bearings
rranged in the housings for adjustment
rally, for the purpose of adjusting it ex-
y to the vertical line of the roller H.
y are also adjustable vertically. This roller H is provided with annular grooves, into which the punches project after passing through the sheet metal. The lower roller, H, is journaled in eccentric bearings K, which are arranged to oscillate in their supports L, and they are provided with arms M, preferably forged to them, for turning them when required. These arms are connected at their outer ends by a bar, N, to insure a uniform action of both the said arms, and so bent and connected to the bearings that they may be turned farther between the limits of the floor and the projections of the upper roller than they could be if they were straight, as is clearly shown. They are raised to move the grooved roller away from the other, and vice versa.

N represents eccentric stops placed on a shaft, P, running through the housings, against which the levers strike when moving the grooved roller up to the other, and whereby they are arrested in the said movement. By turning these stops one way or the other, as may be done by a wrench or other means, the distance of the rollers apart may be varied, and thereby the punching will be finer or coarser.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination of the punching-roller, grooved roller, eccentric bearings K, and operating-levers M, when arranged substantially as specified.

2. The combination of the punching-roller, grooved roller, eccentric bearings, levers, and eccentric stops, when arranged substantially as specified.

3. The combination, with the shaft A, having a fixed collar and clamping-nut, of the radially-slotted rings B and punches D, when all arranged substantially as specified.

4. The combination of the punching-roller, grooved roller, and laterally and vertically adjustable bearings G, when all arranged as specified.

The above specification of my invention signed by me this 16th day of June, 1869.

J. WELLINGTON NESMITH.

Witnesses:
G. B. BACKUS,
H. M. OVERHOOD.

ee follow diagram marked p. 421)

423 No. 000. G. F. Co } p. 423
(Model.) Ew. Co

2 Sheets—Sheet 1.

L. MILLER.

Machine for Splicing or Connecting Bale Ties.

No. 238,417. Patented March 1, 1881.

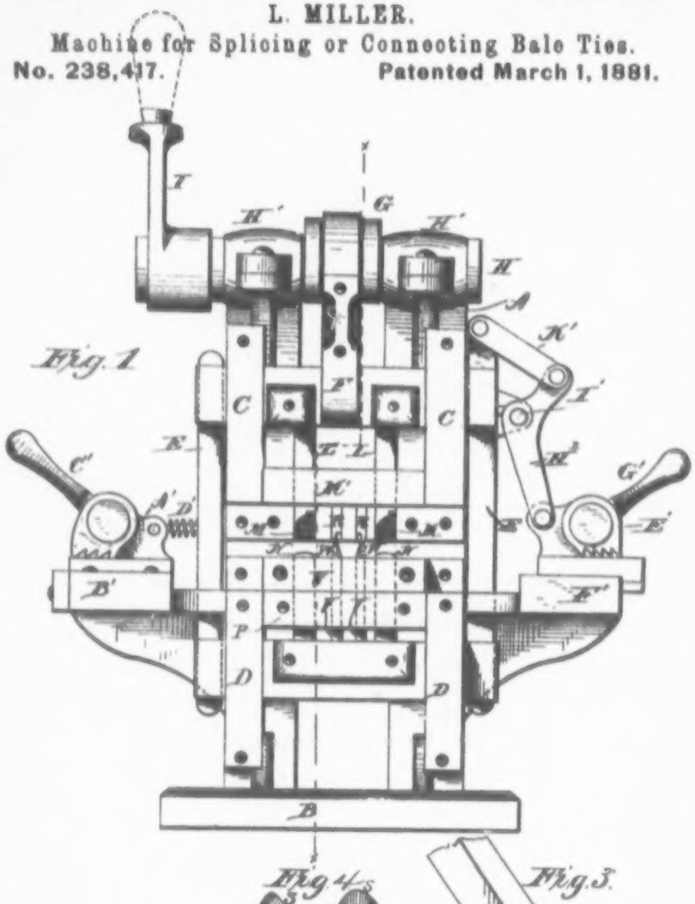

Fig. 1
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H'
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K'
F
F'
C
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I'
E
L
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C'
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M
M
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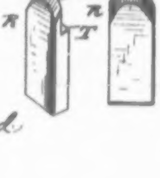
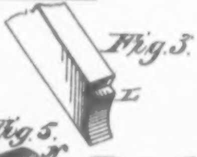
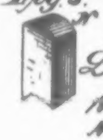
P
D
D
B
x







Witnesses:
Franck L. Ourand
H Aubrey Toulmin

Inventor
Lewis Miller
By
Alexander & Mason
atty

2
7
4

276

424 No. 606 I. H. Co. } p 424
(Model.) E. Tie Co.

2 Sheets—Sheet 2.

L. MILLER.

Machine for Splicing or Connecting Bale Ties.

No. 238,417. Patented March 1, 1881.

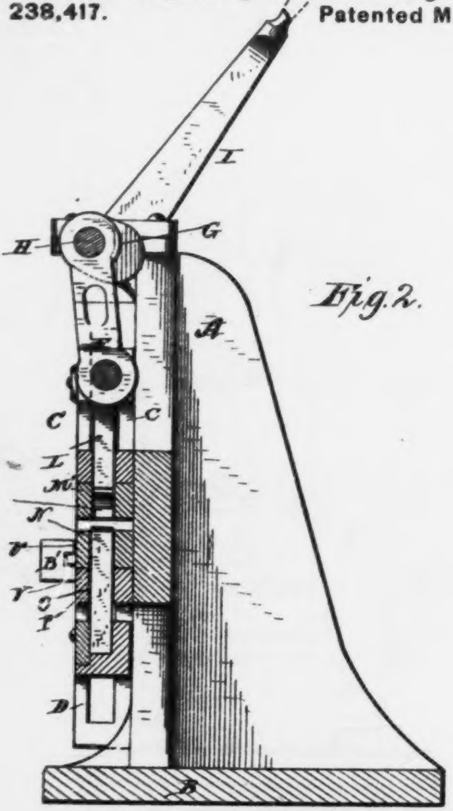
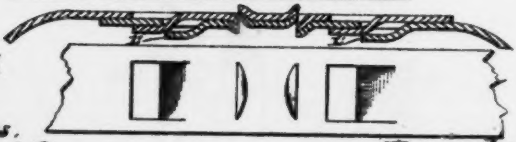


Fig. 2.

Fig. 6.



Witnesses.
Franck L. Ourand
H Aubrey Toulmin

Inventor.
Lewis Miller
By Alexander & Mason
atty

UNITED STATES PATENT OFFICE.

LEWIS MILLER, OF PHILADELPHIA, PENNSYLVANIA.

MACHINE FOR SPLICING OR CONNECTING BALE-TIES.

SPECIFICATION forming part of Letters Patent No. 238,417, dated March 1, 1881.

Application filed November 19, 1880. (Model.)

To all whom it may concern:

Be it known that I, LEWIS MILLER, of Philadelphia, in the county of Philadelphia, and in the State of Pennsylvania, have invented certain new and useful Improvements in Machines for Splicing and Connecting Bale-Ties; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification.

This invention relates to certain improvements in machines for splicing or connecting cotton and other bale ties; and it has for its objects to provide a machine whereby two or more interlocking lips or tongues may be formed in the ends of the band after they have been properly overlapped, and the ends of the band may be drawn automatically in opposite directions so as to interlock the lips, and whereby an intermediate locking-connection may be formed between the interlocked lips or tongues and the lips or tongues may be swaged together, as more fully hereinafter specified. These objects I attain by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 represents a front elevation of my machine complete; Fig. 2, a vertical sectional view of the same; Fig. 3, a detached perspective view of one of the cutters for forming the interlocking lips; Fig. 4, detached perspective views of the cutters or dies for forming the intermediate interlocking parts of the band; Fig. 5, a detached perspective view of one of the swaging-dies, and Fig. 6 detached views of the bale-band with the ends interlocked or spliced.

The letter A indicates a vertical frame, constructed of metal or other suitable material, and mounted upon a base or support, B. The front of said frame is provided with ways C at its upper part and with guides D at its lower part, in which ways and upon which guides are adapted to reciprocate the upper and lower cross-heads of a sliding frame, E, the upper head of which is connected by a pitman, F, to a crank, G, on a shaft, H, located at the upper part of the frame A, and journaled in boxes or bearings H′. The said shaft has fastened at one end a hand-lever, I, by means of which it may be operated to reciprocate the frame E. The upper cross-head of the frame E carries two parallel vertical cutters, L, which work through the vertical apertures M in a stationary cross-head, M′, secured to the front of the frame A. The lower cross-head of the reciprocating frame E carries two swaging-dies, N, which work through apertures O in a stationary cross-head, P, secured to the face of the frame A just below the cross-head M′, the apertures O being in a direct vertical line with the apertures M, so that the swaging-dies, in their upward stroke, will force the lips formed by the cutters together and swage or compress the same, as more fully hereinafter specified.

The upper cross-head, M′, of the frame A, on its lower face, between the apertures through which the cutters work, is provided with two stationary dies, R R, which are formed with cutting-edges S S and shoulders T T, for the purpose of forming intermediate locks between the interlocking lips or tongues. Opposite these dies R R, in the cross-head M′, are two vertical apertures, U U, in cross-head P, in which are adapted to work the vertical cutters V V, which are secured to the lower cross-head of the frame E, between the swaging-dies thereon. The said cutters V V are formed with cutting-edges and shoulders W W, similarly to the stationary dies R R, and are adapted to work up between said dies, so as to cut the metal of the bands and force the parts upward at the proper time, so as to interlock with each other, as more fully hereinafter specified.

The cutters R S T V, by means of their curved cutting-edges, pierce the metal, and the shoulders serve to swage the metal, so as to form the intermediate locking-connection.

The letter A′ indicates a sliding head, mounted in ways B′ at one side of the frame A. The said head has its upper face on a line level with the space between the two cross-heads of the frame A. The said head A′ is provided with a gripe-lever, C′, by which one portion of the band to be spliced is held, the end of said band passing between the cross-heads, as more fully hereinafter specified.

The letter D′ indicates a spring, by means

+ (Here follow diagrams marked pp. 423 + 424) of which a slight yielding motion is permitted to the head A′ when the band is drawn upon, as more fully hereinafter set forth.

On the opposite side of the frame A is located, in the same plane with the head A′, a similar sliding head, E′, which is located in ways F′, and is adapted to slide therein. The said head E′ is provided with a gripe-lever, G′, to seize the band. To the said head E′ is connected the lower end of an angle-lever, H^2, fulcrumed at I′ to the frame A. The upper end of said lever H^2 is connected by means of a link, K′, to the upper part of the frame, so as to oscillate and thereby reciprocate the head E′ as the frame E is reciprocated vertically.

The operation of my invention is as follows: The ends of the bands to be spliced or connected are overlapped and placed within the space between the two stationary cross-heads on the frame A, the two portions being secured to the respective heads by means of the gripe-levers thereon. Upon reciprocating the frame E so as to bring down the upper cutters the same will pass through the overlapped ends of the bands forming the lips L′. Upon reversing the motion of the frame E the head E′ will draw upon the portion of the bale-band which it holds, so as to interlock the lips L′ on the overlapped ends, and directly after the lower cutters will pass through the band at a point between the two series of lips, cutting the metal and forcing the parts together, so as to interlock them. The dies N at the same time are forced upward against the lips, swaging or compressing them securely together.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In combination with the reciprocating frame carrying the cutters and the stationary cross-heads, the heads at each side of the frame provided with gripe-levers to seize the band, one of said heads being connected with the sliding frame by means of an angle-lever and link, whereby the said head may be reciprocated to draw the band and interlock the lips or tongues, substantially as specified.

2. In combination with the sliding frame and the upper and lower stationary cross-heads, the stationary dies secured to the upper stationary cross-head and the corresponding cutting-dies secured to the lower cross-head, and adapted to operate in conjunction to form an intermediate locking-connection between the two sets of interlocking lips or tongues, substantially as specified.

3. In combination with the cutters for forming the interlocking lips and the upper and lower stationary cross-heads, the swaging-dies secured to the lower cross-head of the sliding frame, substantially as specified.

In testimony that I claim the foregoing I have hereunto set my hand this 8th day of October, 1880.

LEWIS MILLER.

Witnesses:
H. AUBREY TOULMIN,
C. A. NEALE.

(No Model.)

J. F. GOLDING.

427

SLASHED METALLIC SCREENING.

No. 297,382. Patented Apr. 22, 1884.

No. 606.
G. F. Co.
v
E. M. Co. } p. 427

FIG. 1.

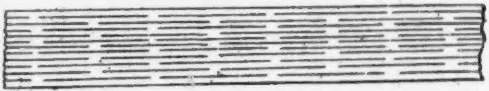
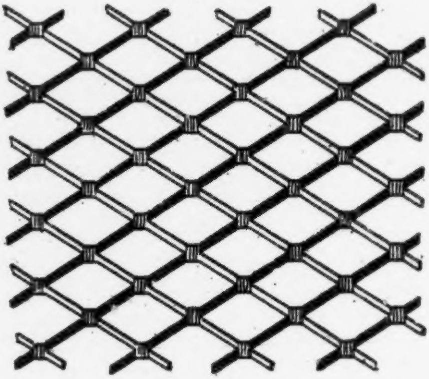


FIG. 2.



WITNESSES:
Henry Lawrence.
J. P. McElroy

INVENTOR
J. F. Golding
BY J. A. Cowles
ATTORNEY

UNITED STATES PATENT OFFICE.

JOHN F. GOLDING, OF CHICAGO, ILLINOIS.

SLASHED METALLIC SCREENING.

SPECIFICATION forming part of Letters Patent No. 297,282, dated April 22, 1884.

Application filed September 24, 1883. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. GOLDING, a citizen of the United States, residing at the city of Chicago, in the State of Illinois, have invented a new and useful Slashed Metallic Screening, of which the following is the specification.

Figure 1 is a view of the sheet metal slashed or cut. Fig. 2 is a view of the same sheet stretched to form the meshes.

The object of this invention is to produce a slashed metallic screening, as will hereinafter be shown.

In the manufacture of my slashed metallic screening, I take a blank piece of sheet metal of the required size and thickness, and at intervals I slash or cut it, as shown in Fig. 1, the slashes or cuts in each line of cuts being opposite to the spaces between the slashes or cuts of the adjoining line or lines. These slashes or cuts are made of the required lengths to form the proper-sized meshes. After the metallic sheet is cut or slashed, as above described, it is stretched in a line transversely to the length of the slashes or cuts, thus forming meshes as shown in Fig. 2. The act of stretching causes the metal forming the boundaries of each mesh to take an oblique position, amounting nearly to a perpendicular line, thus presenting the cut edges of the metal to the surface of the screening. Between the ends of the slashes or cuts are spaces of metal uncut which hold the strands of meshes together. The size of the mesh depends upon the length of the slash or cut, the longer the cut the coarser the mesh, and the shorter the cut the finer the mesh.

Having now set forth one feasible way of producing my slashed metallic screening, I desire it to be understood that I do not restrict myself to the precise details hereinbefore described, for the same can be varied without essential alteration in the characteristics of the article itself, the relative arrangement or position and the form of the slits or slashes, for instance, can manifestly be varied so as to produce a wide range of patterns, ornamental or otherwise, depending upon the use to which the screening is to be put.

The process hereinbefore described of producing the article I reserve for a separate application for Letters Patent.

What I here claim as new and of my own invention is—

As an article of manufacture, metallic screening formed of slashed and stretched metal, substantially as hereinbefore set forth.

JOHN F. GOLDING.

Witnesses:
ALONZO M. GRIFFEN,
F. J. GRIFFEN.

+ (Here follows diagram marked p. 427)

284

429 No. 606 Gn. Co } p.429
Elec. Co

(No Model.) 2 Sheets—Sheet 1.

F. BOMMARIUS.

BALE BAND SPLICING MACHINE.

No. 309,375. Patented Dec. 16, 1884.

Fig. 1.

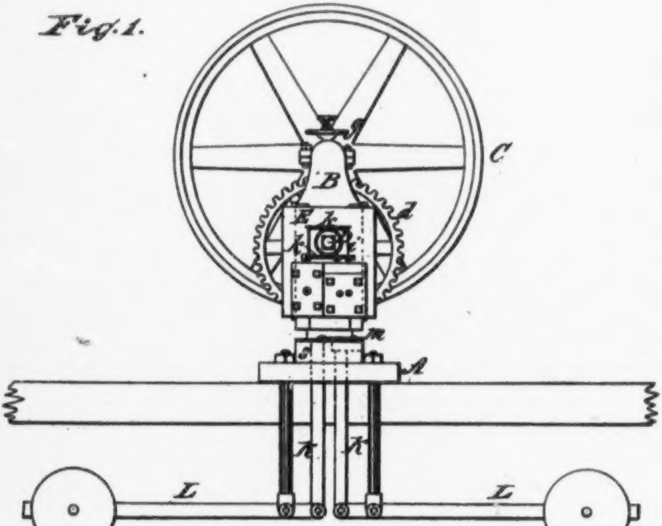

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Fig. 2.

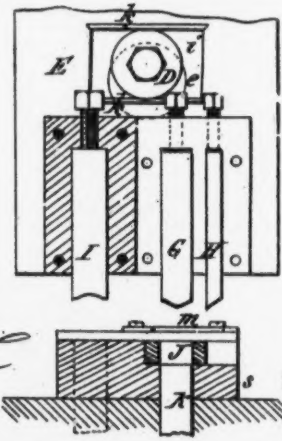
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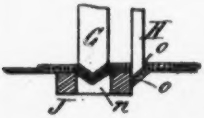
Fig. 7.



WITNESSES:
Theo. G. Hoster
C. Sedgwick

INVENTOR:
F. Bommarius
BY Munn & Co
ATTORNEYS.

430 No. 606 G. F. Co. C. Ill. Co. } p. 430

(No Model.) 2 Sheets—Sheet 2.

F. BOMMARIUS.

BALE BAND SPLICING MACHINE.

No. 309,375. Patented Dec. 16, 1884.

Fig. 3.

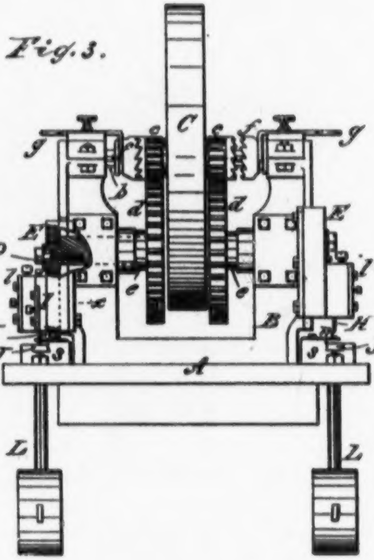

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Fig. 5.

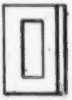


Fig. 4.

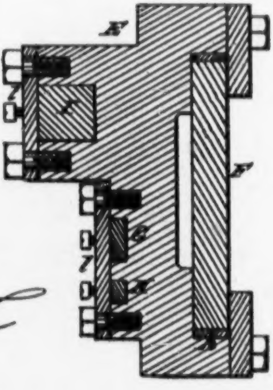
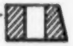


Fig. 6.



WITNESSES:

Theo. G. Hoster

C. Sedgwick

INVENTOR:

F. Bommarius

BY Munn & Co

ATTORNEYS.

UNITED STATES PATENT OFFICE.

FREDERICK BOMMARIUS, OF NEW ORLEANS, LOUISIANA.

BALE-BAND-SPLICING MACHINE.

SPECIFICATION forming part of Letters Patent No. 309,375, dated December 16, 1884.

Application filed January 10, 1884. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK BOMMARIUS, of New Orleans, in the parish of Orleans and State of Louisiana, have invented certain new and useful Improvements in Machines for Splicing Bale-Bands, of which the following is a full, clear, and exact description.

This invention has for its object the construction of a machine for expeditiously and efficiently splicing metallic bands used in baling cotton and other materials which are of sectional construction, and may be made of or from scrap or surplus lengths of other baling-bands after the bales they are used on have been reduced by compression. The splicing-tie for thus utilizing baling-band scrap or waste which the machine is designed to produce consists of two cut and bent slit loops in the faces of the lapping ends of the band-sections arranged to enter one within the other, and which are afterward secured by a transverse key passed within the engaging loops. It also consists in locking-lips produced by cutting and indenting the lapping end portions of the band-sections from their one face side, as fully described in another application for Letters Patent for an improved band-tie splice made by me simultaneously with this.

The invention consists of combinations and arrangements of parts, substantially as hereinafter fully set forth and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 represents a front elevation of a machine in part embodying my invention; Fig. 2, a side view in part upon a larger scale and in partial section, showing the construction and arrangement of the several punches on one side of the machine and means for operating them; also, a die in connection with which the split-loop-forming punch and the lip-forming punch operate, and a clearer for lifting the work out of the die. Fig. 3 is a partly sectional and broken side view of the press; Fig. 4, a horizontal section in part thereof upon a larger scale, mainly on the line *x x* in Fig. 3. Fig. 5 is a top view of one of the dies, and Fig. 6 a transverse section thereof. Fig. 7 is a diagram in illustration of the action of the punches or certain of them upon the band-sections to be spliced.

A is the bed of the press or machine, and B its frame, which may be of any suitable construction. In using the machine for splicing sectionally-constructed cotton-bale bands the same power which is used to work the cotton-baling press may, by suitable connections, be applied to operate the band-splicing machine.

This machine, which occupies but little room and requires only a boy or unskilled workman to control it and pass the work to, through, and from it, is, as here shown, of double construction, so as to do duplicate work on opposite sides of it.

Power is or may be applied to the machine by a pulley, C, upon the shaft *b* of which are pinions *c c*, that give motion to spur-gears *d d* upon independent shafts *e e*, that operate the punches on opposite sides of the machine. The pinions *c c* are loose upon their shafts, and are respectively put into or out of connection therewith by sliding feathered clutches *f f*, actuated by handles or levers *g g*, whereby the machine may either be operated as a single or double one, as required; and in case of accident or necessary repair on one side of the machine the punches on said side may be thrown out of gear without interfering with or stopping the punches on the other side of the machine.

Upon the outer end of each independent shaft *e* is formed an eccentric, D, which serves as the shaft revolves to give up and down motion to a slide, E, arranged to work upon or against a fixed guide, F, Fig. 4, forming a portion of the frame, and fitted with gibs *h h*, to provide for wear. Said slide is made with an aperture, *i*, for the eccentric D to work in, and is fitted with upper and lower steel plates, *k k*, for the eccentric to act against in raising and lowering the slide; and it, furthermore, is fitted in its face with adjustable punches G H and a compressor, I, inclosed by covering-plates *l*. These punches, in connection with a lower die, J, seated in a block, *s*, on the bed of the machine, serve to give the necessary form to the splicing-tie, as follows: The lapping ends of the band-sections to be

(Here follow diagrams marked p.p. 429 & 430) united are fed upon or placed over the die under a suitable side guide, *m*, and the punches G H are simultaneously brought down by one and the same eccentric or means upon the lapped band-sections to simultaneously cut and bend and cause to engage with one another the slit-loops *n n* in said sections, and to cut and indent the locking-lips *o o* thereon, the punch G producing the slit-loops and the punch H the locking-lips. (See Fig. 7.) This operation is continued throughout the entire series of splices, to be made in the band. Of course, it will be understood that punch G is a bar rectangular in cross-section the side edges of whose lower beveled surfaces will begin to cut or slit the metal the instant the point of said punch begins to bend the latter, and coincidently with said point, and as the point continues to descend said edges will continue to cut or slit the metal simultaneously with and until the bending operation is completed. Each die J is or may be fitted with an automatic clearer, K, attached to a weighted lever, L, that yields to the action of the punch G, but that serves, when said punch is raised, to elevate the clearer and lift the slit-looped portion of the band-sections out of the die should it have any tendency to stick there. After the several band-sections have been thus united a transverse key is inserted within or through each split-looped portion on its under side to secure the engagement of the loops, and the sectionally-constructed splicer-band is presented on its looped side or surface to the action of the compressor I, which, coming down, closes or presses the loops down on the keys.

If desired, by a slight change of the punches and dies on the one side of the press the machine may be used for making the buckles which are ordinarily used for locking the bands on the bales.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination, with the bed-die and the reciprocating slide, of the double-beveled punch with its side edges cutting parallel slits or slots, and its point bending or indenting the metal intermediately of said slots or slits, substantially as and for the purpose set forth.

2. The combination, with the bed-die and the reciprocating slide, of the double-beveled punch, with its side edges cutting parallel slits or slots and its point bending or indenting the metal intermediately of said slits or slots, and a single-beveled punch, substantially as and for the purpose set forth.

3. The combination, with the bed-die and the reciprocating punch, of the automatic clearing device, comprising a weighted lever provided with a pivoted arm with its upper end entering the die-bed opening, substantially as and for the purpose set forth.

4. The punch having the double-beveled point with side cutting-edges disposed to cut in planes at right angles to the bending action of said point, in combination with the reciprocating slide, the punch having a single-beveled point, and the compressor, together with a die-block, substantially as and for the purpose set forth.

FREDERICK BOMMARIUS.

Witnesses:

J. W. RAABE,

M. HERNANDEZ.

433
(Model.)

No. 606
G. F. Co.
v.
Cin. Co.
} p 433

I. KINNEY.

METALLIC FENCING.

No. 312,864. Patented Feb. 24, 1885.

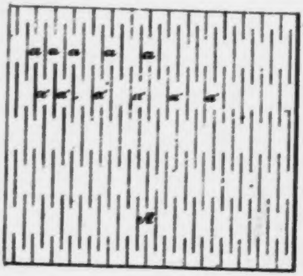

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Fig. 1.

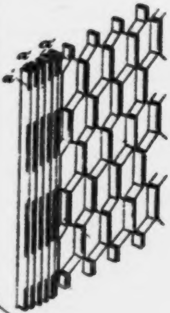

Fig. 2.

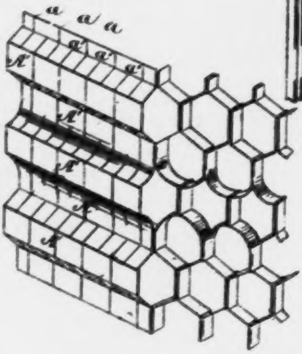
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Fig. 3.

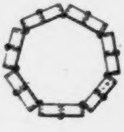

Fig. 5.

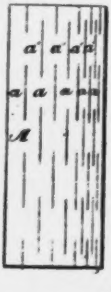

Fig. 4.

Witnesses.
Robert Everett.
Jo. L. Coombs

Inventor:
Israel Kinney
By James L. Norris.
Atty.

UNITED STATES PATENT OFFICE.

ISRAEL KINNEY, OF WINDSOR, ONTARIO, CANADA.

METALLIC FENCING.

SPECIFICATION forming part of Letters Patent No. 312,964, dated February 24, 1885.

Application filed January 23, 1885. (Model.) Patented in Canada October 9, 1884, No. 20,339, and in England December 5, 1884, No. 16,003.

To all whom it may concern:

Be it known that I, ISRAEL KINNEY, a sub- ect of the Queen of Great Britain, residing t Windsor, Province of Ontario, Dominion f Canada, have invented new and useful Im- rovements in Sheet-Metal Fences, of which he following is a specification.

My invention consists, essentially, in a panel r open metallic frame-work constructed from single sheet of metal, said sheet being pro- ided with several series of slits, the slits of ach series being formed in the same straight ine and breaking joints with the slits of the ontiguous series, for which a patent has been ranted in Canada October 9, 1884, No. 20,339. he sheet thus prepared is then corrugated or ent in a direction substantially at right an- les with the lines or series of slits a a, &c., as hown in Figure 3. An edge view of the plate hus slitted and corrugated would give an out- ne similar to one-half of the complete sec- ons of open-work. It will be seen that the idth, shape, and arrangement are such that ertain longitudinal portions of the plate are ft in the same vertical plane, and these por- ons extend from end to end of the plate, sub- antially between the ends of two rows of its, a or a'. If, now, beginning at one end of e plate, the metal is folded over upon itself the line of the first series of slits, a, there ill be formed a series of vertically-arranged penings similar in form to those shown at e right hand of Fig. 3; and by again fold- g it in the opposite direction in the line of e next succeeding series of slits, a', a new d alternating series of openings will be ad- d. The corrugated and slitted sheet is thus lded alternately in opposite directions, the ccessive folds being in the lines of the suc- ssive series of slits, as also shown in the ght-hand portion of said Fig. 3, thereby rming an open lattice or frame work, the ape of each opening being governed by the culiar form given to the corrugations above scribed. The flat sheet may be folded in posite directions alternately along the lines the said slits, and the metal then opened t, so that an open metallic frame-work is de all of a single sheet of metal, without jointing, the metal itself presenting its edges perpendicularly, or nearly so, to the general surface of the sheet, thereby producing a very stiff structure and of greater or less strength, dependent on the spaces between the successive series of slits being greater or less.

In carrying out my invention, Fig. 1 represents a sheet of metal provided with a number of series of slits, as the sheet would appear in its original flat condition. Fig. 2 shows the same when the sheet has been creased alternately in opposite directions along the slitted lines and a part of the sheet opened out so as to form the panel or open metallic frame-work which illustrates my invention. Fig. 3 shows the plate illustrated in Fig. 1 provided with longitudinal flutings or corrugations formed substantially at right angles to the series of slits a a, &c., and having a portion of the sheet folded alternately in opposite directions along the lines of slits, whereby it is caused to open out into its completed form. Fig. 4 illustrates a variation, the distance between the series of slits growing less and less from one end of the sheet to the other, thereby producing a finished panel or frame-work which shall be stiffer and heavier at one edge than at the other. Fig. 5 illustrates a modified construction.

In carrying out my invention, A represents a flat piece of sheet metal, in which a a a, a' a' a', &c., represent alternate series of slits made through the sheet A, the slits a breaking joints with the slits a', as shown in Fig. 1. The sheet is subsequently bent or folded alternately in opposite directions along each series of slits, as shown in Fig. 2. This permits of the metal being then bent and opened out so as to form the completed fabric as similar in appearance to that shown in Fig. 2. In practice I prefer to provide the sheet with corrugations A', as shown in Fig. 3, after the same has been slitted. It needs only then to be folded in opposite directions alternately along the slitted lines, in order to give to it at once its finished condition, as also shown in Fig. 3.

In the finished panel or sheet there is presented an open frame-work of metal, without seam or joint, and the metal is presented edge-

(Here follows diagram marked p. 433)

wise toward the general surfaces of the panel or sheet, thereby giving to the frame-work great stiffness and strength. The stiffness and strength can be made greater or less according as the distance between the successive series *a* and *a'* of slits is made greater or less, for the thickness from face to face of the panel or sheet will be equal to the said distance.

It is apparent that the shapes of the openings in the finished panel may be varied greatly by simply giving different shapes to the corrugations shown in Fig. 3, two forms being there shown.

This invention admits of several obvious variations: Thus a post may be made by simply folding closer every alternate fold, thus causing the sheet to curl into a cylinder or cone, as shown in Fig. 5. So, also, as shown in Fig. 4, the distance between alternate series of slits *a* and *a'* may be made less and less, so as to produce a panel or sheet which shall be stiffer and stronger at one edge than at the other, and well adapted for gates, &c.; or the slits may be given an angular direction across the sheet from top to bottom, and also a variety of work may be produced, in all of which the same structure, substantially, is made, presenting the same feature of the metal presenting its edges toward the surfaces of the sheet, and so making an open frame-work of great strength and stiffness without break or joint. This is designed more especially for fences of various kinds, but is equally applicable for many other purposes—as, for instance, platforms, gratings, screens, &c.

It is apparent that in folding the metal it may be bent completely back upon itself or only partially so. In both the edges would be presented toward the faces of the finished panel—in the former case at right angles, in the latter at a less angle.

The cut edges may be protected and the sheet strengthened by galvanizing, if desired, after the same is completed.

I have stated above that the sheet is slitted and then corrugated; but in some instances I first form the corrugations and then cut the slits. Either method may be followed as circumstances may require.

What I claim is—

1. A sheet-metal fabric formed of a single integral plate of metal, said fabric having openings which are substantially polygonal, and the metal being bent or doubled upon itself in opposite directions alternately in lines coinciding with successive series of slits, to present the edges of the metal toward the faces of the fabric, substantially as described.

2. A sheet-metal fabric formed from a single integral metallic plate having a number of series of transverse slits, the slits of one series breaking joints with those of the adjacent series, said plate having longitudinal corrugations and being bent or folded upon itself alternately in opposite directions, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ISRAEL KINNEY.

Witnesses:
Jas. A. Rutherford,
Jos. L. Coombs.

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(No Model.)

J. F. GOLDING

PROCESS OF MAKING METALLIC SCREENING MATERIAL.

No. 320,240. Patented June 16, 1885.

Fig. 1.

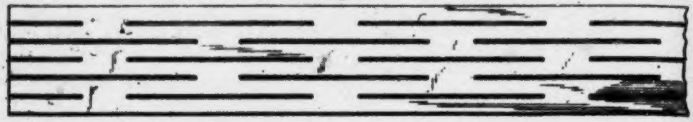

Fig. 2.

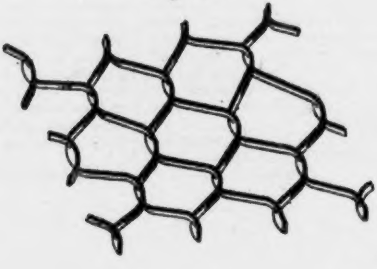

Fig. 3.

WITNESSES
F. L. Ourand
E. W. Fay.

INVENTOR
John F. Golding
By Jas. A. Cowles
Attorney

UNITED STATES PATENT OFFICE.

JOHN F. GOLDING, OF CHICAGO, ILLINOIS.

PROCESS OF MAKING METALLIC SCREENING MATERIAL.

SPECIFICATION forming part of Letters Patent No. 320,240, dated June 16, 1885.

Application filed December 13, 1884. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. GOLDING, a citizen of the United States, residing in the city of Chicago, in the State of Illinois, have invented a new and useful Process for Making Metallic Meshed or Screening Material, of which the following is a specification.

Figure 1 is a view of the material cut or slashed ready for forming the meshes. Fig. 2 is a view of the metal after the meshes are formed. Fig. 3 is an end view of Fig. 1, showing the slashed metal before the meshes are formed.

I take a piece of metal and make a series of rows of incisions throughout it, and between the ends of these incisions I leave uncut spaces, these incisions or cuts being so arranged that the uncut spaces will be at or about midway of the adjoining cuts, and thus the incisions or cuts and the uncut spaces are made to alternate throughout the sheet, the uncut spaces connecting the strands one with another, and the whole remaining in one piece, as is shown in Fig. 1. The metal thus prepared is opened at the slits by causing the cut edges to be passed by each other all in the same direction, and away from the original plane of the metal a sufficient distance to produce the desired size of mesh, the ends of each strand being bent in opposite directions at or near the uncut spaces sufficiently to set the metal and maintain the mesh, as is shown in Fig. 2. The metal is expanded so that the strands and uncut spaces have their greatest movement in the direction of or near a right angle to the original plane of the metal, and a less movement of the ends toward the center, the strands and uncut spaces having a base in the aggregate equal in width but shorter than the piece from which they are cut.

I claim—

1. In the art of making screening from slashed metallic plates or sheets, the improvement of bending the strands flatwise, line after line of strands successively, in forming the meshes, and setting the strands, substantially as before set forth, so that the strands will be disposed edgewise in the thickness of the finished screening.

2. The process herein shown for making slashed metallic screening, which consists as follows: making a series of rows of incisions or cuts throughout the metal, and between these incisions or cuts leaving uncut spaces, each uncut space being alongside of and between two incisions or cuts, and at or near the center of said cuts, the incisions or cuts of each row of incisions or cuts made to alternate with the uncut spaces throughout the entire piece of metal, opening the incisions or cuts in a manner to cause the cut edges to be passed by each other all in the same direction perpendicular to the original plane of the metal, thus bending each strand in opposite directions at points at or near the uncut spaces sufficiently to set the metal and maintain the mesh, the metal being so expanded that the several strands have their greatest extension in the direction of or near a right angle to the original plane of the metal, and a less movement of the ends toward the center, thus expanding the metal into a mesh.

JOHN F. GOLDING.

Witnesses:
P. P. AYER,
J. S. SALISBURY.

(Here follows diagram marked p. 436)

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G. F. Co.
v.
Ew. Co. } p-438

(No Model.)

5 Sheets—Sheet 1.

J. F. GOLDING & G. B. DURKEE.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

No. 320,241. Patented June 16, 1885.

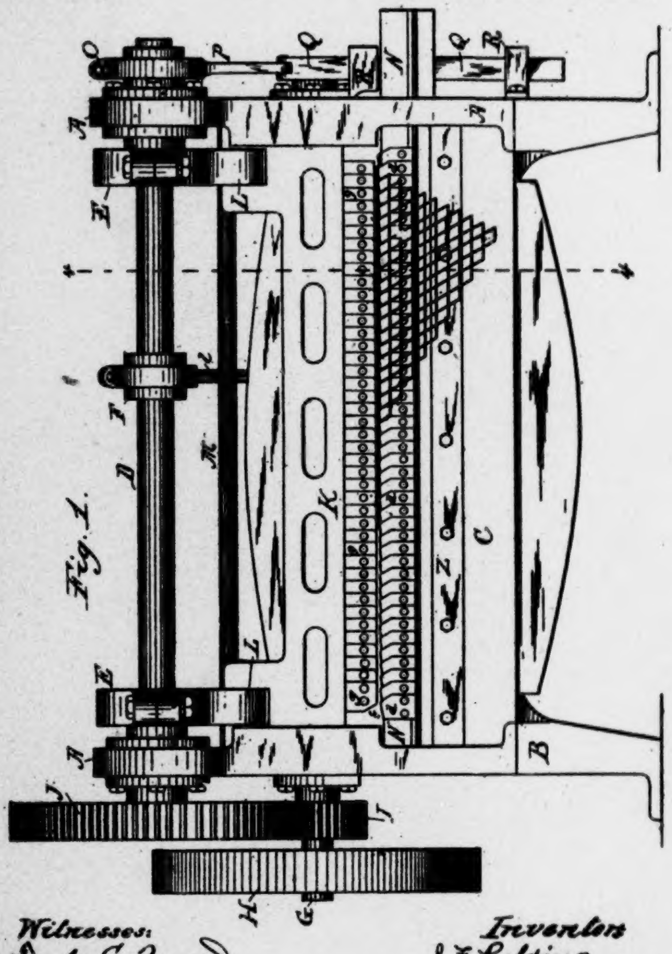

Fig. 1.

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B
J
J
H
G

Witnesses:
Taylor E. Brown
Lew. E. Curtis.

Inventors
J. F. Golding
Geo. B. Durkee
By Jas. A. Cowles
his Attorney.

No. 606
G. F. Co
v.
Cin. Co. } p. 439

(No Model.)

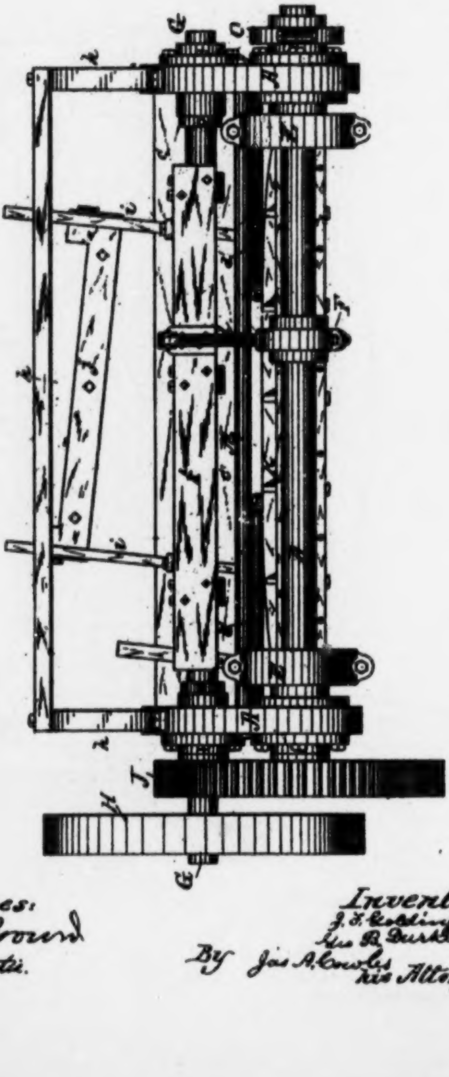
5 Sheets—Sheet 2.

J. F. GOLDING & G. B. DURKEE.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

No. 320,241. Patented June 16, 1885.

Fig. 2.



Witnesses:
Saylor E. Brown
Lew. C. Curtis

Inventors:
J. F. Golding
Geo. B. Durkee
By Jas. A. Cowles
his Attorney

440 Geo. Webb. G. F. Co v. E. W. Co. } p. 440

(No Model.) 5 Sheets—Sheet 3.

J. F. GOLDING & G. B. DURKEE.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

No. 320,241. Patented June 16, 1885.

Fig. 4.

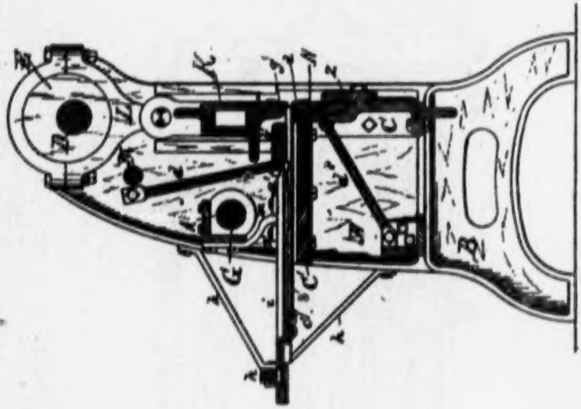
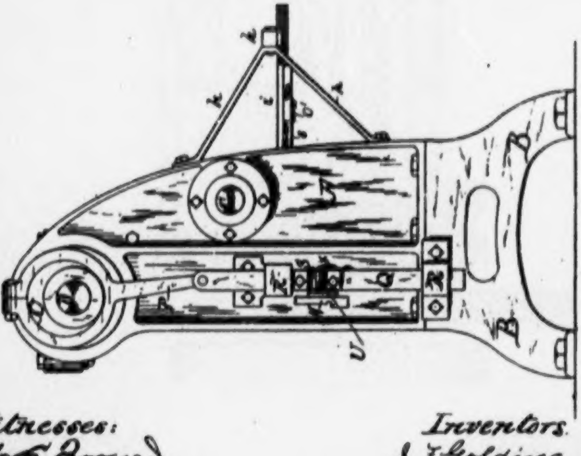


Fig. 3.



Witnesses:
Taylor E. Brown
Lew. C. Curtis.

Inventors.
J. F. Golding
Geo. B. Durkee
By Jas. A. Cowles
his Attorney:

441 Ny. 606. G. F. Co Exu. Co. p. 441

(No Model.) 5 Sheets—Sheet 4.

J. F. GOLDING & G. B. DURKEE.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

No. 320,241. Patented June 16, 1885.

Fig. 5.

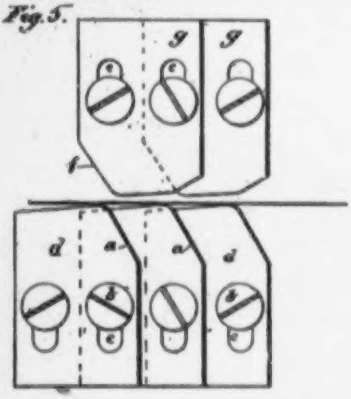

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Fig. 6.

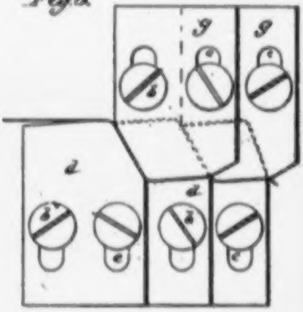
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Fig. 7.

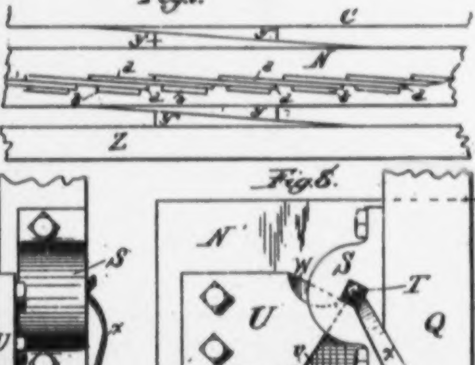
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Fig. 9.

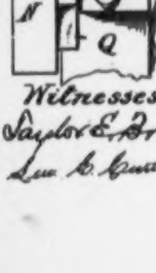
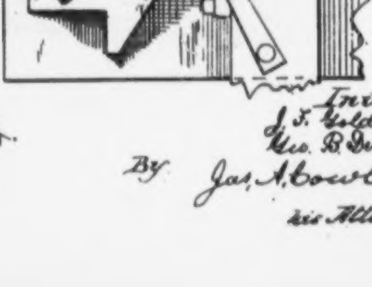


Fig. 8.



Witnesses:
Saylor E. Brown.
Lew C. Curtis.

Inventor.
J. F. Golding
Geo. B. Durkee
By Jas. A. Cowles,
his Attorney.

442 Ho. Cob.
G. F. Co.
Ex. Co. } p. 442

(No Model.) 5 Sheets—Sheet 5.

J. F. GOLDING & G. B. DURKEE.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

No. 320,241. Patented June 16, 1885.

Fig. 10.

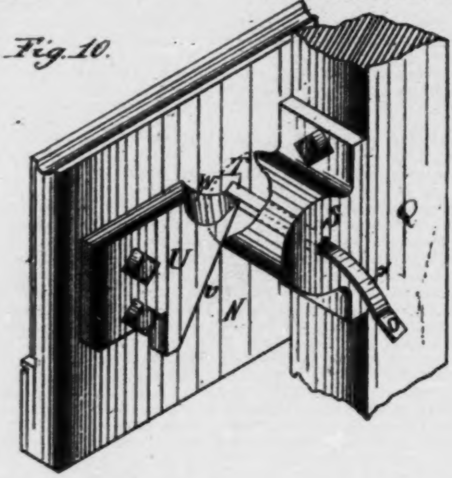


Fig. 11.

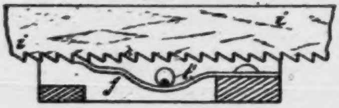
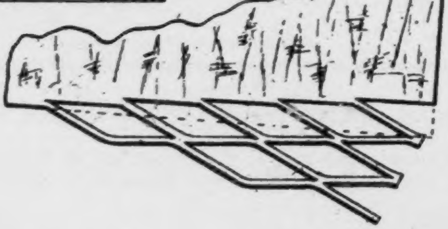


Fig 12.



Witnesses:
Taylor E. Brown
Lew: S. Curtis

Inventors
J. F. Golding
Geo B. Durkee
By Jas A Cowles
his Attorney

UNITED STATES PATENT OFFICE.

JOHN F. GOLDING AND GEORGE B. DURKEE, OF CHICAGO, ILLINOIS,
ASSIGNORS TO THE EXPANDED METAL COMPANY.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

SPECIFICATION forming part of Letters Patent No. 320,261, dated June 16, 1885.

Application filed August 28, 1884. (No model.)

To all whom it may concern:

Be it known that we, JOHN F. GOLDING and GEORGE B. DURKEE, citizens of the United States, residing in Chicago, in the State of Illinois, have invented certain new and useful Improvements in Machines for Simultaneously Cutting and Expanding Slashed Metallic Screening, of which the following is the specification. #

Figure 1 is a front view or elevation. Fig. 2 is a plan view. Fig. 3 is an end view opposite to end where power is applied. Fig 4 is a vertical sectional view through line 4 4, Fig. 1. Fig. 5 is detail of cutters in position to receive the metal for cutting and expanding. Fig. 6 is detail of knives in position after having cut and expanded the metal. Fig. 7 is a top view of lower bar, showing position of lower series of cutters and the guides which cause the bar holding the lower cutters to move slightly obliquely to itself, but parallel with each lower cutter. Fig. 8 is a side view of one end of lower bar, showing cam for giving said bar longitudinal movement, and plunger which holds the dog that actuates the cam. Fig. 9 is an end view of end of lower bar shown in Fig. 8. Fig. 10 is a detail of cam movement to return lower bar to first position, as hereinafter will be explained. Fig. 11 is detail of ratchet and spring-catch for feeding sheet metal to cutters. Fig. 12 is a view of metal partially cut and formed and partially uncut.

The nature and object of this invention is to provide a machine for cutting and expanding slashed metallic screening, which was the subject of Patent No. 297,382, issued to John F. Golding, one of the applicants hereof.

A and B are the posts of the frame of the machine.

C is the front cross-beam, supported by the posts A and B.

D is the main shaft of machine, located at top and working in suitable bearings in the posts A and B. On this shaft are the eccentrics E E and eccentric F, the last being located near the center of shaft D.

G is the driving-shaft, suitably boxed in both end posts A B, and carrying drive-wheel H and spur-wheel I.

To the shaft E is attached a large cog-wheel, J, driven by spur-wheel I.

K is the upper bar, holding the upper series of cutters and actuated in a vertical plane by eccentrics E E and links L L.

M is a brace extending from one post to the other to strengthen the machine.

N is the lower bar, holding the lower cutters. This bar is provided with inclined offsets *y y*, and is movable between guides *y' y'*, one of which is on front side of bar C, and the other is on back of bar Z. Bar Z is a cap extending along face of bar C, and provided with guides corresponding with the guides on front of bar N. The object of these guides is to give the bar N a slight oblique movement to cause the cutters attached to it to move paralell to the cutters on upper bar, K.

O is an eccentric on end of shaft D, and by pitman P connected to plunger Q, which works through guides R R.

On plunger Q, Fig. 10, is fastened the box S, in which works the dog T. This dog works against the cam U, which is attached to the lower bar, N, on its side near its end. This cam is cut beveled on the under side at V, and on the upper side it is formed with a scalloped bevel at W.

X is a spring fastened at its lower end to the plunger Q, the upper end resting against the outer end of dog T. This spring presses the dog against the cam U.

To the lower bar, N, is attached a series of cutters, *d*, by means of screws *b*, Figs. 5 and 6, where they are shown in detail. In each cutter is the slot *c*, through which the screw *b* works to admit of their being adjusted when worn. The form of these cutters is shown in the first one *d* of the series. The front edge is cut beveling, as shown at *e*. These cutters are placed one overlapping the other, as shown at *d d*, Fig. 7, and also in Figs. 1 and 2.

To the upper bar, K, Fig. 1, are fastened a series of cutters, *g g*, attached to this bar in a similar manner, each one overlapping the other in the same manner, and the rear lower part of each upper knife is cut beveling, as shown at *f f*, Figs. 1 and 5.

h h h, Fig. 2, is a frame attached to the posts A B, and extending backward in brace form, which is more clearly shown in Figs. 3 and 4.

i i, Figs. 2, 3, and 4, are two ratchet-bars, supported at their rear ends by the frame *h*, and secured to a bar, *h'*, at their front ends.

Here follow diagrams marked pp. 438 to 442)

The bar *b′* reaches from post A to B over the bed *c′* of the machine, just back of the cutters, and is supported at its center by braces *d′ d′*, reaching from posts A B.

j, Fig. 2, is cross-bar extending from ratchet-bar *i* to *i*, and sliding beneath them. At each end of cross-bar *j* is a spring, *t′*, Fig. 11, one end being fastened to the cross-bar *j* and the other working against ratchet *i*, so placed that it allows the cross-bar *j* to freely move forward toward the cutters, but prevents it moving backward. By turning the cam *t″*, located above the spring *t′*, the free end of this spring is depressed, which allows the cross-bar *j* to be moved backward.

k, Figs. 2 and 4, is an angle-bar extending lengthwise of shaft G, and attached thereto by two or more collars extending around said shaft G freely working thereon, and connected to the main shaft D by the pitman *l*, working on eccentric F.

To collar *k*, Figs. 2 and 4, is attached dog *m*, and extending downward, the lower end working between heads *a′ a′*. These heads are fastened to the ratchet-bars *i i*, and there are two of these dogs *m*.

d″ is a brace extending from posts A B to center and top of front of cross-bar C, to steady and support the machine.

The operation of our machine is as follows: Motion is communicated to the main driving-wheel H by belt or otherwise. As the eccentrics on E E revolve, the bar K is raised and lowered, which works the cutters *g g* fastened thereto up and down in vertical planes and over the cutters *a a* in lower bar, N. The position of the cutters before making their cutting movement is shown in Fig. 5—that is, they are separated, leaving a space between them. As the upper cutters descend in a vertical plane, the bevel edge of the upper cutters move along the surface of the bevel edge of the lower cutters, and the lower bar, N, to which the lower cutters are attached, being allowed to freely move longitudinally in its bearings, the descent of the upper cutters causes the lower cutters to move horizontally, and when the upper cutters have finished their downward movement the two sets of cutters are in the positions shown in Fig. 6. The downward and upward movement of upper cutters is caused by the eccentrics on shaft D. The return movement of lower shaft, N, with its cutters is accomplished as follows: As the downward movement of the cutters is made the plunger Q also descends, and at the same time the dog T, Fig. 10, takes its position on the lower bevel of cam U, and as the plunger rises the bar N is returned to its original position. A sheet of metal of the proper size is placed in position on bed C′, with the rear edge resting against bar *j*, as shown at *s*, Fig. 4. The eccentric F on shaft D causes the collar *k* to rock, which in turn causes the lower end of dog *m* to vibrate. This causes the ratchets *i i* to move backward and forward, which in turn causes the cross-bar *j* to move forward and feed the metal to the cutters, and as the metal passes between the two sets of knives it comes out in strands cut and bent, (leaving uncut intervals,) which form and maintain a mesh, as more plainly shown in Fig. 12. In Fig. 1 it is shown in the act of issuing from between the knives.

It will be observed that there are intervals where the material is uncut, and that these uncut intervals form the union of the meshes. This uncut interval is formed as follows: The lower bar, N, is moved a certain distance. This distance is such that the upper corner of the beveled edge of the lower cutters is a little beyond the lower corner of the beveled-edged corner on upper cutters, and this distance between these two corners determines the uncut interval in the metal. The feeding movement is so adjusted that the metal is fed at each movement just far enough to form the strand, and as the upper cutters descend they push ahead of them that part of the metal, and at the same instant cut it from the main part of the metal, and this cut strand lies between the beveled edges of the two cutters and against the lower edges of the upper cutters. The entire piece of metal is consumed, and no part or portion is lost or wasted.

It will be observed that the metal is fed at an angle with the line of the cutters and parallel with the face of each cutter, and that the bar *j*, which forces the metal between the cutters, is set at an angle with the line of the cutters and parallel with the face of each cutter.

The reason why we feed the metal at an angle with the main cutting-bars of the machine is, first, that the said bars may be in line with the main shaft, and, second, that the metal may encounter the cutters first on one corner and in a line parallel with the surface of each cutter. The object in beginning to cut at one corner of the metal is that each cut, strand, or loop will be set free by a cut immediately back of it, said cut or cuts always supplying as much length of strand as the preceding knives consume, as the pressing the strands downward and forming the mesh causes the cut and spread part of the metal to assume a form shorter than the uncut part.

The improvement in the art of making screening from metallic plates or sheets incidental to the operation of this machine is claimed in our application for a United States Patent filed August 28, 1884, Serial No. 142,328.

We claim—

1. In a machine for cutting slashed metallic screening, the combination of the upper bar, K, provided with the cutters *g g* and having a vertical movement, with the lower bar, N, provided with cutters *a a* and having a longitudinal movement, as and for the purpose shown.

2. In a machine for cutting slashed metallic screening, the bar K, provided with cutters cutting over bar N, provided with similar knives, the first working vertically while the second is working horizontally, to provide the

necessary cutting-surface and space for the cut loops to expand.

3. In a machine for cutting slashed metallic screening, the cutters in each cutter-bar arranged one overlapping the other for the purpose of simultaneously cutting a number of slashes and forming loops, leaving uncut sections between them for the purpose of forming a continuous mesh from one piece of metal without cutting away or wasting any of the material, as and for the purpose shown.

4. The combination of the cutter-bar provided with cutters set at a slight angle with the surface of the bar with guides whose faces are parallel with the faces of the cutters, causing the cutters to travel in a line with their own faces and the bar to have a slight oblique movement, substantially as shown.

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GEORGE R. DURKEE.

Witnesses:
JAS. A. COWLES,
J. P. MCELROY.

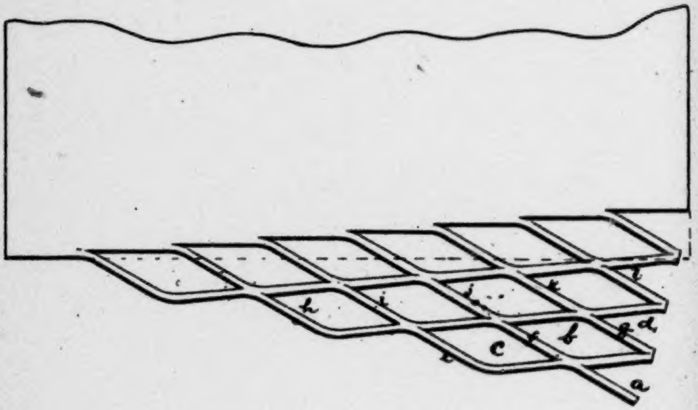
446 No. 606.
G. F. Co.
v.
E. M. Co. } p. 446

(No Model.)

J. F. GOLDING & G. B. DURKEE.

PROCESS OF MAKING SLASHED METALLIC SCREENING.

No. 320,242. Patented June 16, 1885.



Witnesses:
Saylor E. Brown
Lew. E. Curtis

Inventor:
John F. Golding
Geo. B. Durkee
By Jas. A. Cowles.
his Attorney

UNITED STATES PATENT OFFICE.

JOHN F. GOLDING AND GEORGE B. DURKEE, OF CHICAGO, ILLINOIS, ASSIGNORS TO THE EXPANDED METAL COMPANY.

PROCESS OF MAKING SLASHED METALLIC SCREENING.

SPECIFICATION forming part of Letters Patent No. 320,242, dated June 16, 1885.

Application filed September 5, 1884. (No model.)

To all whom it may concern:

Be it known that we, JOHN F. GOLDING and GEORGE B. DURKEE, citizens of the United States, residing in the city of Chicago, Illinois, have invented a new and useful Process for Manufacturing Slashed Metallic Screening, of which the following is a specification.

The nature and object of this invention is to provide a process whereby slashed metallic screening, as described in Patent No. 297,382, issued to John F. Golding, one of the applicants hereto, can be successfully manufactured.

The accompanying drawing shows a sheet of metal used in manufacturing slashed metallic screening, partially cut and partially uncut.

The process consists in the employment of a flat piece of metal of any desired size, and beginning at one side and corner and making an incision within the side of the metal, thus forming a strand which is simultaneously pressed away from the plane of the metal in a direction at or near a right angle, the position the stand assumes depending upon the distance it is moved from the plane of the metal. *a* in the drawing shows the first cut made. The next step in this process is to make additional incisions, as is shown at *c*, *b*, and *d*, further within the plate of metal, and leaving uncut sections at the ends of the cuts, and simultaneously with the cutting the strands are pressed away from the plane of the metal at the angle and to the desired position, as above described. Thus each row of meshes is simultaneously cut and formed from a blank piece of metal without buckling or crimping the blank. In the act of cutting and forming the meshes, the finished article is contracted in a line with the cuts or incisions, and consequently it is shorter in this direction than the piece from which it was cut, but is greatly lengthened in a line at an angle to the plane of the original sheet plate or blank.

The object of beginning to cut within one side and the corner is, that the cut furthest within the metal will produce a strand which as it is cut and bent downward or away from the plane of the uncut metal will allow the strands in advance of it to be freely cut and bent away from the plane of the metal simultaneously therewith. It is evident that the meshes could not be cut and simultaneously formed if the cuts were made in a single direct line across the metal, for the reason that as the meshes are made the article which they form is contracted to a length less than the original length of the metal from which it is cut.

By inspecting the drawing it will be observed that the line between the cut and uncut parts of the metal is in step form, thus forming an oblique line across the metal.

Our application for a United States Patent, filed August 28, 1884, Serial No. 141,621, describes a machine for practicing this invention.

We claim—

1. In the art of making metal screening by slashing metallic plates or sheets and then bending the strands flatwise line after line successively in forming the meshes and setting the strands, the improvement which consists of opening successive lines of meshes on lines parallel with one another, but oblique to the original edge of the sheet, substantially as before set forth.

2. The process herein shown and described of making slashed metallic screening, which consists in cutting successive slashes or incisions in the sheet, beginning at one side and near the corner thereof, and pressing the strips thus partially disconnected from the sheet successively away from the sheet in a direction oblique thereto, but otherwise in a plane perpendicular to said sheet, or substantially so, the two operations, as well as the further operation of bending the connected material and giving form and set to the meshes, being effected by the simultaneous operations of slashing and pressing.

JOHN F. GOLDING.
GEORGE B. DURKEE.

Witnesses:
JAS. A. COWLES,
J. P. MCELNEY.

+ (Here follows diagram marked D. 446)

448 No. 606 G.F. Co Eliw. Co

(No Model.)

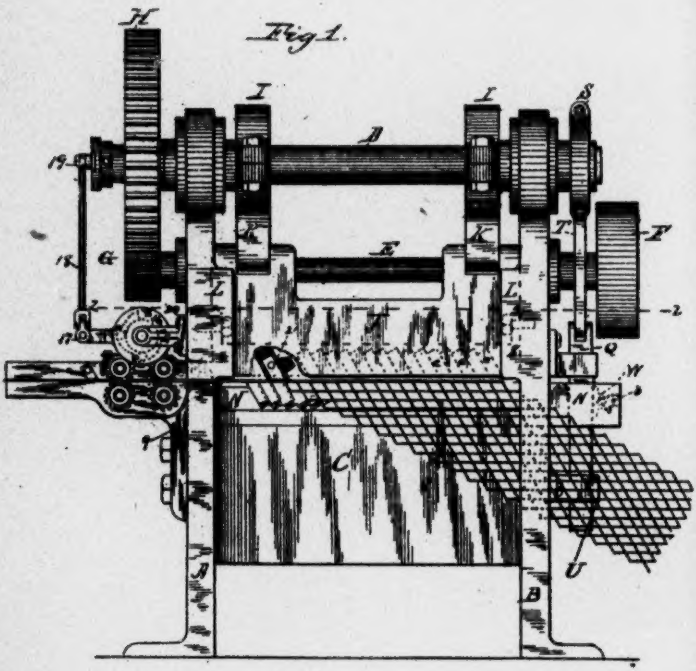
4 Sheets—Sheet 1.

J. F. GOLDING & G. B. DURKEE.

MACHINE FOR SLASHING AND EXPANDING FLAT SHEET METAL TO FORM MESHES.

No. 381,230. Patented Apr. 17, 1888.

Fig. 1.


H
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Q
W
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N
C
9
A
B
U

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449 N.Y. Ovo.
E.F.Co.
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(No Model.) 4 Sheets—Sheet 2.

J. F. GOLDING & G. B. DURKEE.

MACHINE FOR SLASHING AND EXPANDING FLAT SHEET METAL TO FORM MESHES.

No. 381,280. Patented Apr. 17, 1888.

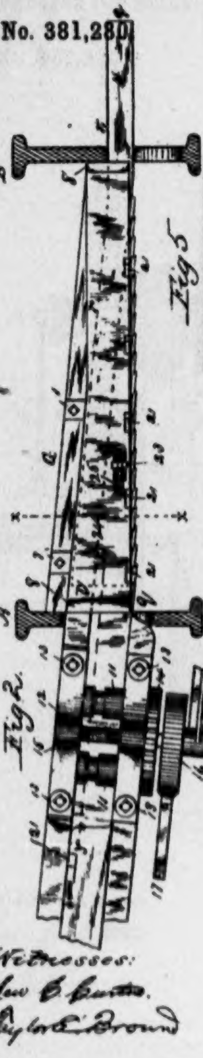
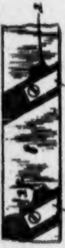
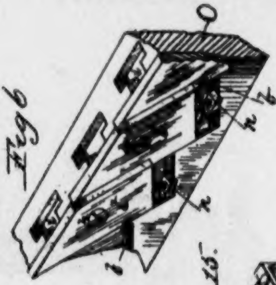
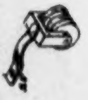
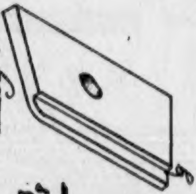


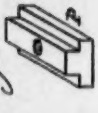
Fig 2.
B
F
f
1
G
x
x
f
1
A
g
21
22
23
24
10
11
12
13
14
15
16
17
20











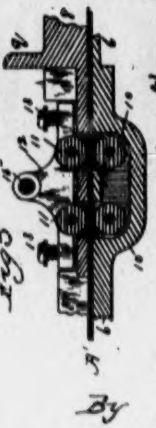


Fig 3
A'
g
f
b
10
11
12
13
15

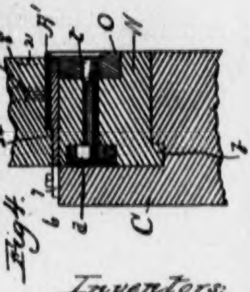


Fig 4.
f
21
24
H'
c
O
11
z
b
1
d
C

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By Jas. N. Cowles
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450 No. 606 G. L. Co
" Ellis Co. } p. 450

(No Model.) 4 Sheets—Sheet 3.

J. F. GOLDING & G. B. DURKEE.

MACHINE FOR SLASHING AND EXPANDING FLAT SHEET METAL TO FORM MESHES.

No. 381,230. Patented Apr. 17, 1888.

Fig. 12.

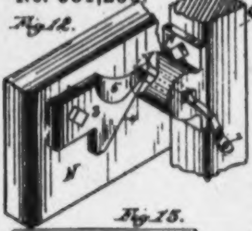


Fig. 9.

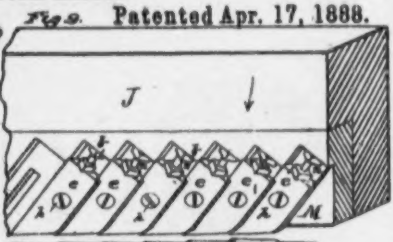
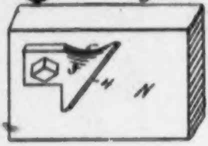


Fig. 13.



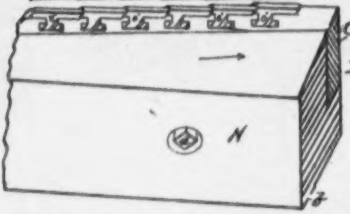
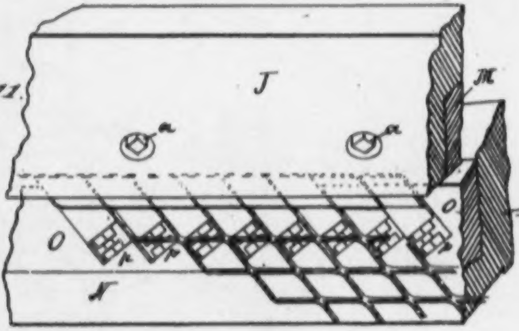


Fig. 10.

Fig. 11.



Witnesses:
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451 [illegible] p.451

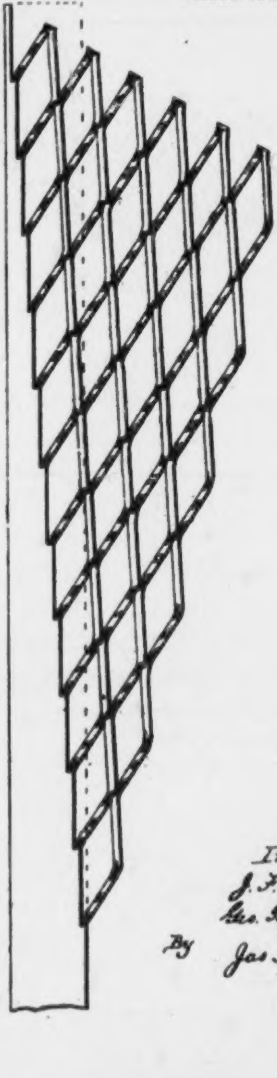
(No Model.) 4 Sheets—Sheet 4.

J. F. GOLDING & G. B. DURKEE.

MACHINE FOR SLASHING AND EXPANDING FLAT SHEET METAL TO FORM MESHES.

No. 381,230. Patented Apr. 17, 1888.

Fig. 14.



Witnesses:
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Inventors:
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Geo. B. Durkee

By Jas A Cowles.
their Attorney

UNITED STATES PATENT OFFICE.

JOHN FRENCH GOLDING AND GEORGE B. DURKEE, OF CHICAGO, ILLINOIS, ASSIGNORS, BY DIRECT AND MESNE ASSIGNMENTS, TO THE EXPANDED METAL COMPANY, OF MISSOURI.

MACHINE FOR SLASHING AND EXPANDING FLAT SHEET METAL TO FORM MESHES.

SPECIFICATION forming part of Letters Patent No. 381,230, dated April 17, 1888.

Application filed March 31, 1886. Serial No. 196,735. (No model.)

To all whom it may concern:

Be it known that we, JOHN FRENCH GOLDING and GEORGE B. DURKEE, both citizens of the United States, and residents of the city of Chicago, in the State of Illinois, have invented certain new and useful Improvements in Machines for Slashing and Expanding Flat Metal to Form Meshes, of which the following is a pecification.

Figure 1 is a front elevation of the machine, lso showing the metal formed into meshes issuing from the machine. Fig. 2 is a plan iew through line *z z* of Fig. 1. Fig. 3 is a ertical sectional view through line *y y* of Fig. . Fig. 4 is a vertical cross sectional view hrough line *x x*, Fig. 2. Fig. 5 is a detail ront elevation of bar-holding dogs. Fig. 6 is detail perspective view of lower knife-bar, howing knives in position. Fig. 7 is a perpective of one of the knives. Fig. 8 is a perpective of nut-block. Fig. 9 is a sectional erspective view of upper vertically-traveling eam, showing knives and knife-bar in posiion. Fig. 10 is a sectional perspective of ower longitudinally-traveling bar, showing nife-bar and upper ends of knives attached hereto. Fig. 11 is a reverse view of Figs. 9 nd 10, showing strands of expanded metal in onnection therewith. Fig. 12 is a detail perpective of device for actuating lower longiudinally-traveling bar. Fig. 13 is a detail erspective of cam shown in Fig. 12. Fig. 14 hows a piece of flat metal partially cut and artially uncut and expanded in the form of eshes. Fig. 15 shows roller with threaded urface and spring to force it down.

The nature and object of this invention are provide a machine for cutting and expandg flat metal into the form of meshes.

Similar letters and figures of reference refer similar parts in the different figures.

A and B are the end frames of the machine, onnected together by a bed-piece, C.

D is the main shaft, working in the frames and B, provided with suitable bearings.

E is the driving-shaft, secured to frames A d B by suitable boxing, having at one end e pulley F and at the other end the spur gear-wheel G, the latter not shown in the drawings, but being located at the rear of main gear-wheel H and gearing therewith.

I I are eccentrics located on shaft D between the frames A and B.

J is the vertically-traveling cross-head, connected to eccentrics I I by links K K and traveling in guides L L on frame A B.

M is the knife-bar attached to the vertically-traveling cross-head J, and secured thereto by suitable bolts, *a a*, Fig. 11.

N is the longitudinally-traveling bar, located on bed-plate C, as shown in Figs. 4 and 10, provided with guide *b*, working in a slot in the bed-plate C.

O is the knife-bar attached to the longitudinally-traveling bar N, and fastened thereto by bolt *d*.

e e e are knives attached to the upper knifebar, M, placed at an angle thereon, as shown in Fig. 9 and in dotted lines on beam J, Fig. 11. The said knives are fastened to the knifebars M and O, Figs. 9, 10, and 6 by countersunk bolts *h*, which pass through the knife and into the nut-block P. This nut-block is in T form and fits in corresponding recesses, *i i*, in bars M and O, Figs. 6 and 10. These knives are made adjustable upward and downward by bolts and jam-nuts *n n*, located at one end, Figs. 6 and 9, and working against shoulders *b*.

The knives in both upper and lower bars are secured in the same manner by the use of nutblocks P, which are similarly located in both bars, and also are adjustable by the bolts and jam-nuts *n n*, similarly located in the respective bars. The knives *t*, Fig. 6, on lower bar, O, also are placed at an angle with the bar to which they are attached. The knives on the upper bar are set facing the knives in the lower bar, as shown in Figs. 9, 10, and 11. In the simultaneous respective movements of the upper and lower bars the inclined surfaces of the upper knives move along parallel with the inclined surfaces of the lower knives, the faces of the knives fitting closely together. The lower longitudinally-traveling bar, N, is of a wedge form, as shown in Figs. 10 and 2. In Fig. 2 it is more clearly shown extending from

(See following diagrams marked pp 448 & 457) q to q, the dotted line r showing the rear beveled edge, the knives covering the front line of the bar. On the end of shaft D, Fig. 1, opposite gear-wheel H, is the eccentric S, from which extends pitman T, which actuates plunger Q, and the latter, working in box U, Fig. 1, actuates pawl V, which is located in box W and held in position by the spring 2. (See Fig. 12.)

3 is a cam located on longitudinally-traveling bar N, Figs. 1, 12, and 13, having under edge, 4, cut beveled, Figs. 12 and 13. On the upper surface of the lower longitudinally-traveling bar, N, is a stationary plate, 6, firmly fastened to lower bed-plate by projections 7 7, Figs. 2 and 4, extending through frame A and supported by brackets 9, Fig. 1.

8, Figs. 3 and 4, is a pressure bar, located above plate 6, extending between and secured to frame A B, as is also shown by dotted lines in Fig. 1. This pressure-bar 8 extends through frame A to the front of the feeding device over plate 6. In Fig. 3 are shown the plates 6 and 8 and the feeding device attached thereto.

10 10, Fig. 3, are lower feed-rolls in cut-away part of plate 6. 11 11 are upper feed-rolls in plate 8. The surfaces of these feed-rolls are corrugated. The feed-rolls 11 11 are held in place by cap 12 and tension-springs and bolts 13 13. (Shown in Figs. 2 and 3.)

In Fig. 3 the upper rollers, 11 11, are shown annularly grooved to allow plate 8 to remain in a continuous strip, the lower rolls being similarly grooved for a like purpose. These feed-rolls are actuated by gears at one end of each, which are driven by a larger wheel, Fig. 2, on shaft 15. On this shaft is a clutch wheel, 16, with arm 17, Figs. 1 and 2, joined to the lower end of connecting-rod 18, which is connected to crank-pin 19 on main shaft D. This crank-pin is adjustable by means of a slot and a set-screw. The end of shaft 15 works in caps 12, Figs. 2 and 3, and its projecting end is supported by bracket 20, attached to frame A.

In pressure-bar 8, Figs. 1, 2, 4, and 5, are shown dogs 21, loosely attached to said bar at their upper ends by a bolt and dropping obliquely therefrom, and on their upper sides are set springs 22, their lower beveled ends being serrated and located close to the upper knives.

23, Figs. 2 and 4, is a roller having screw-like projections, forming corresponding annular grooves on its surface, set in bar 8, and set at an angle with the rear face of the lower bar, N, and is pressed downward by spring 25, Fig. 15.

The under surface of the pressure-bar 8, Fig. 4, is partially cut away, leaving flange 24, which fits into a correspondingly cut-away part in plate 6, for the purpose of forming a guide.

The operation of our machine is as follows: Motion is communicated to the main driving-wheel by pulley F and through intermediate connections to eccentrics, which in turn raise and lower the cross-beam J, to which are secured the upper knives. As the upper knives descend, their inclined edges engage with the inclined edges of the lower knives, causing the lower bar, N, and its knives to travel in a longitudinal direction, as indicated by the arrows in Figs. 9 and 10. As the upper beam, J, descends in direction indicated by the arrow, the plunger Q also descends, being actuated by eccentric S. In this act of descending the pawl V passes over the sloping surface 5 of cam 3, Fig. 12, when it is returned beneath the beveled edge 4 of said cam by spring 2. In the upward movement of the plunger the pawl V moves upward in a vertical line, and by this act forces a return of bar N to its original position.

It will be observed that in its longitudinal movement the lower bar, N, moves in a direction oblique to the face to which the knives are secured, the knives in both upper and lower bars being set at an angle with the plane of these bars, and as the upper knives, having beveled or inclined edges, have to pass downward along the beveled or inclined edges of the lower knives, causing a downward shear cut, the rear plane of the lower bar is correspondingly beveled to allow the knives to travel in their individual planes.

A′, Fig. 3, is a piece of flat metal fed between the bars 6 and 8, and by means of the feed-rolls is carried over the knives of the lower bar intermittingly along the line of the guide 24, Figs. 4 and 3. Consequently it is first brought in contact with the knives at one of its corners, and that part between the knives is simultaneously cut and pressed downward by the downward movement of the upper knives, the receding action of the lower knives allowing the cut strands to be expanded downward and to contract endwise. At the next feed it is evident that the metal will encounter additional knives, and so on until it has passed to the knife farthest from the feed-rolls, when at each downward stroke the upper knives of the machine are cutting to their full capacity.

In Fig. 11 is shown the position of the strands being cut and bent downward from the plane of the metal, the length of the uncut spaces depending upon the length of the feed. The feed-rollers are actuated from a crank-pin on the main shaft D. In Fig. 1 is shown the material cut and expanded, with an uncut portion in the act of being fed into the machine. The metal passes under dogs 21 freely, and is clutched by the dogs through the action of springs 22, and is firmly held between the dogs and plate 6, allowing the longitudinally-traveling bar N to be freely moved by the cutting action of upper knives, the dogs preventing the retreat of the metal while it is being cut, which otherwise would be forced backward by the shearing cut of the upper knives. As the metal is fed into the machine, it passes under guide-wheel 23, which revolves at an angle with the direction of the travel of the metal.

The clutch which actuates the feed-rolls can be any kind that will grasp the shaft rod turn it in one direction and slip by the shaft in the other direction.

We claim—

1. In a machine for cutting and expanding flat metal into meshes, the combination of two sliding cutter-heads each provided with cutters and each set of cutters arranged in step form on its respective head, the movement of one cutter-head being longitudinal and the movement of the other being at or near a right angle thereto, the cutters of each set adapted to fit into and pass over the faces of the other set, and a suitable intermittent feeding device arranged and adapted by means of mechanism to feed metal between said cutters in line with and in the direction of the forward travel of said longitudinally-traveling head.

2. In a machine for cutting and expanding flat metal into meshes, the combination of two sliding cutter-heads each provided with cutters and each set of cutters arranged in step form on its respective head, the movement of one cutter-head being longitudinal and the movement of the other being at or near a right angle thereto, the cutters of each set adapted to fit into and pass over the faces of the other set, and a suitable fixed guide located at the rear of and parallel with the travel of said longitudinally-sliding head.

3. In a machine for cutting and expanding flat metal into meshes, the combination of two sliding cutter-heads each provided with cutters and each set of cutters arranged in step form on its respective head, the movement of one cutter-head being longitudinal and the movement of the other being at or near a right angle thereto, the cutters of each set adapted to fit into and pass over the faces of the other set, and a suitable clamping device constructed substantially as described and adapted for holding the metal and preventing its retreat while it is being cut and expanded.

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328

(No Model.) 455

7 Sheets—Sheet 1.

J. F. GOLDING.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

No. 381,231.

Patented Apr. 17, 1888.

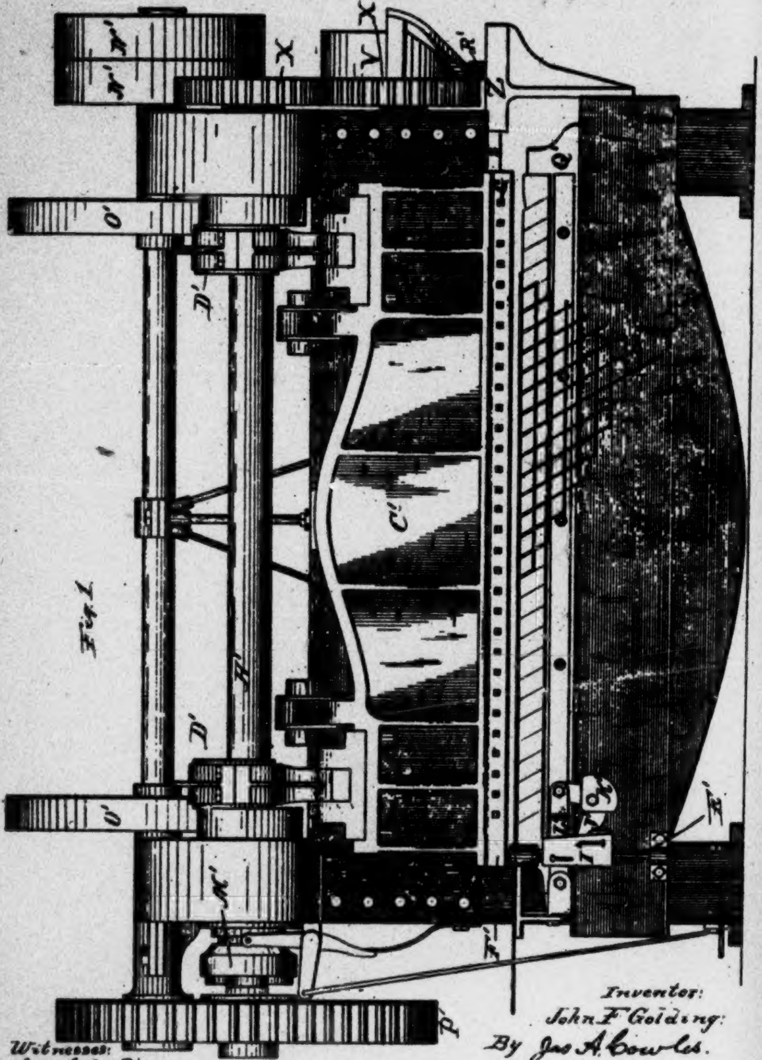

Fig. 1

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No. 606.
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330

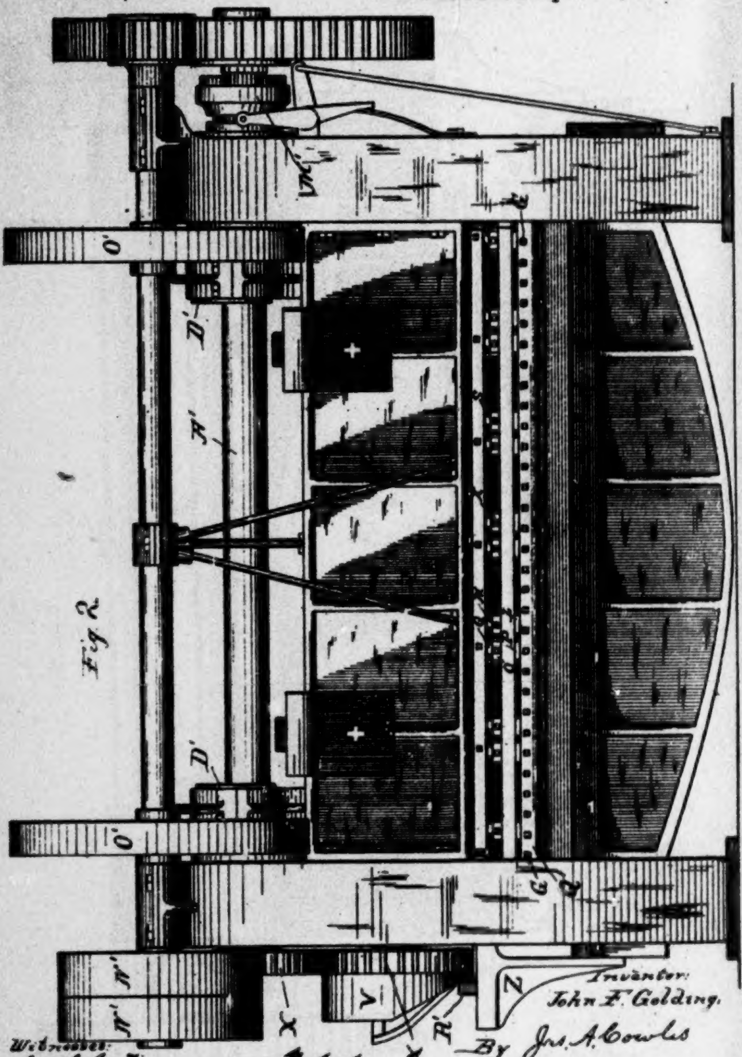
(No Model.) 7 Sheets—Sheet 2.

456

J. F. GOLDING.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

No. 381,231. Patented Apr. 17, 1888.



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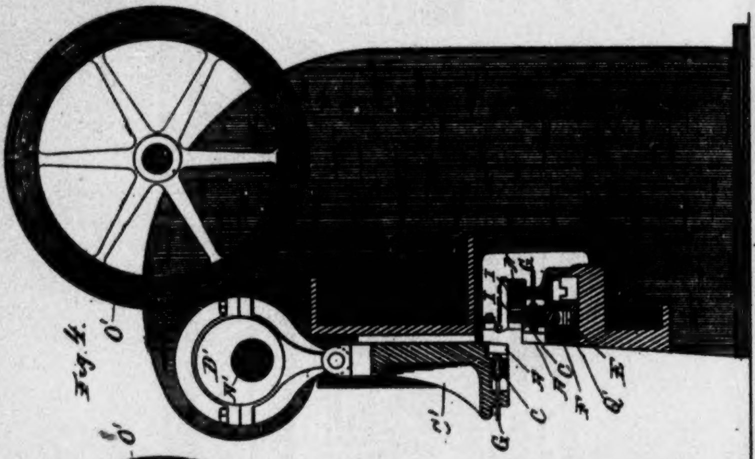
(No Model.) 7 Sheets—Sheet 3.

J. F. GOLDING.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

457 No. 381,231. Patented Apr. 17, 1888.



O'
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Fig. 4.

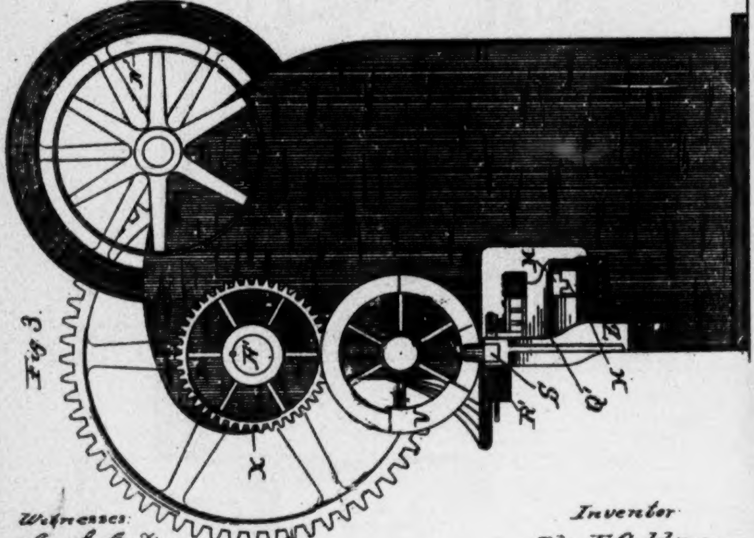

Fig 3.

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G. Fr. Co.
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E.M. Co. } p.457

458 No. 606
G. F. Co
v
Emi Co } p. 458

(No Model.)

7 Sheets—Sheet 4.

J. F. GOLDING.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

No. 381,231. Patented Apr. 17, 1888.

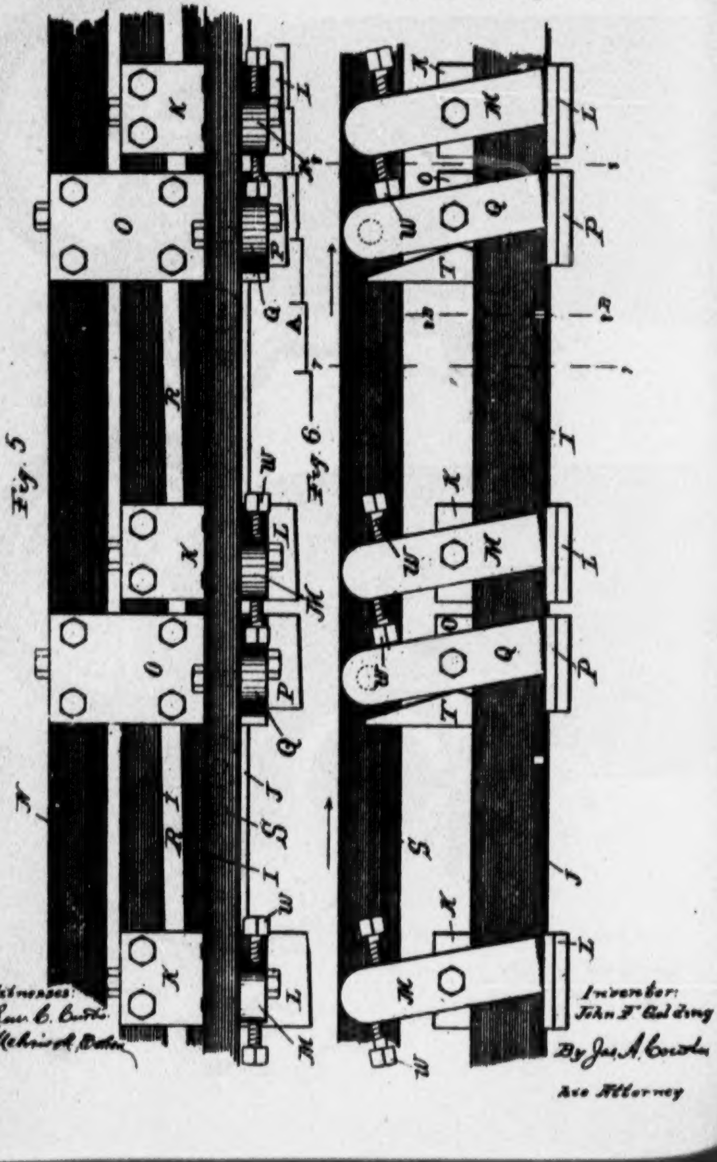

Fig. 5

Fig. 6

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459 No. 6060 G. F. Co. Ew. Co } p. 469

(No Model.) 7 Sheets—Sheet 5.

J. F. GOLDING.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

No. 381,231. **Patented Apr. 17, 1888.**

Fig. 7.

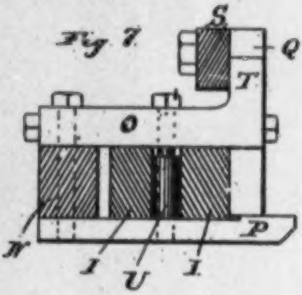

Fig. 8.

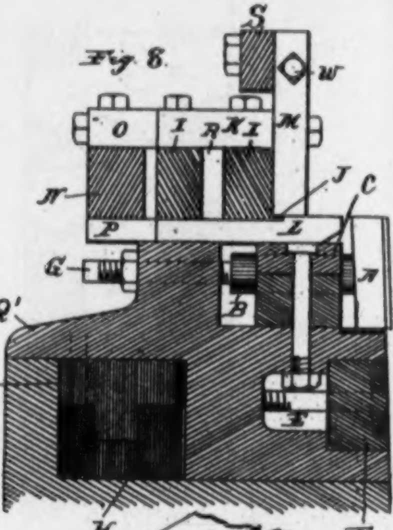
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Fig. 8B

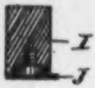
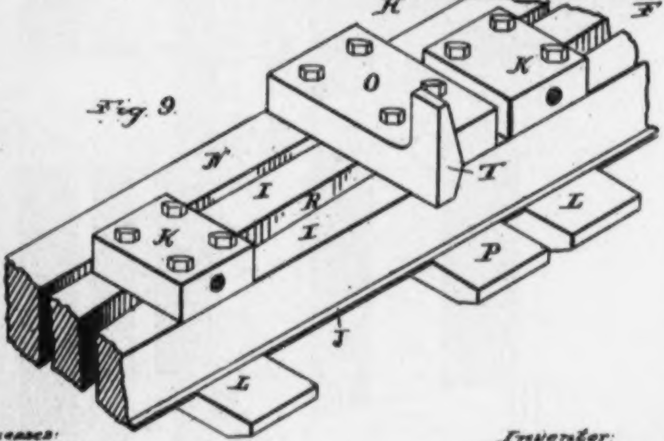


Fig. 9.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Inventor:
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338

460 No. 606. G. F. Co. Civ. Co. 5 } p. 4460

(No Model.) 7 Sheets—Sheet 6.

J. F. GOLDING.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

No. 381,231. Patented Apr. 17, 1888.

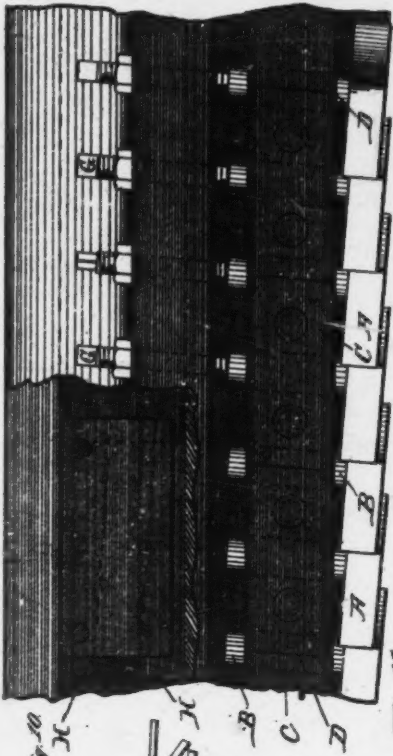
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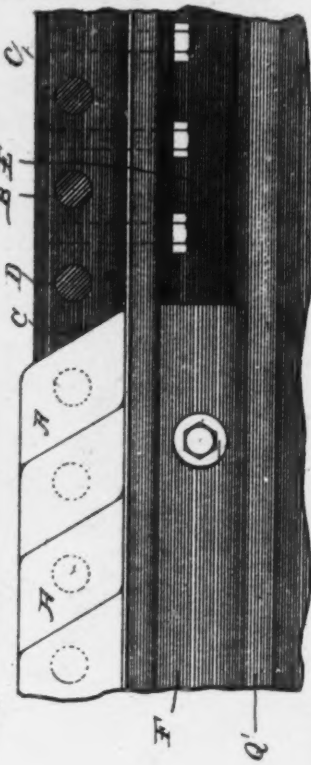
Fig. 10

Fig. 11


C1
B E
C D
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A
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Q'

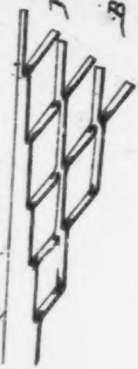

Fig. 13

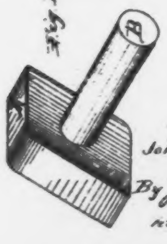

Fig. 12

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461 No. 606. G. F. Co. Erie Co. } $ 461.

(No Model.) 7 Sheets—Sheet 7.

J. F. GOLDING.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

No. 381,231. Patented Apr. 17, 1888.

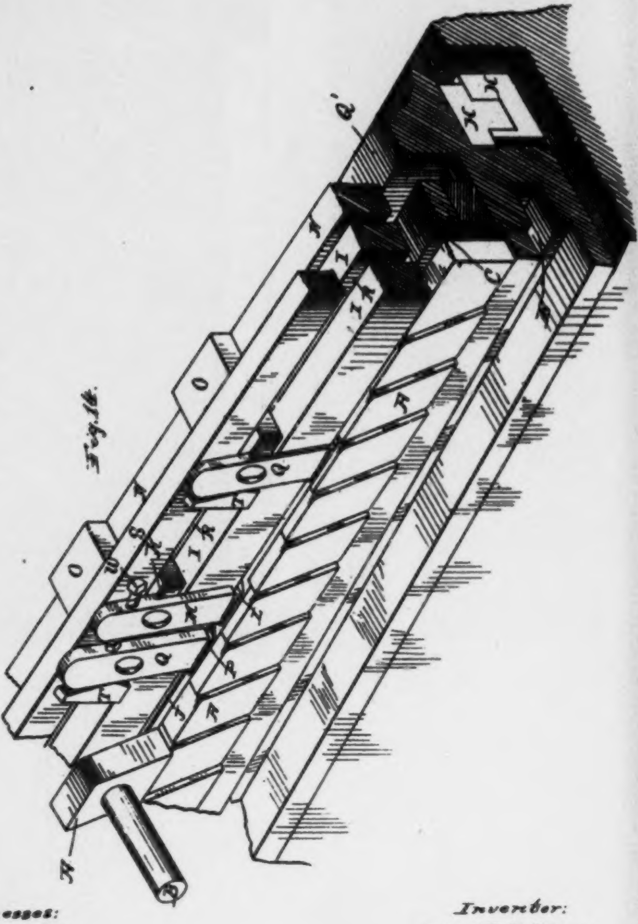

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Fig. 14.

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his Att'y

UNITED STATES PATENT OFFICE.

JOHN FRENCH GOLDING, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE EXPANDED METAL COMPANY, OF MISSOURI.

MACHINE FOR MAKING SLASHED METALLIC SCREENING.

SPECIFICATION forming part of Letters Patent No. 381,231, dated April 17, 1888.

Application filed January 7, 1887. Serial No. [illegible]. (No model.)

To all whom it may concern:

Be it known that I, JOHN FRENCH GOLDING, a citizen of the United States, residing in the city of Chicago, in the State of Illinois, have invented certain new and useful Improvements in Mechanism for Manufacturing Slashed Metallic Screening, of which the following is a specification.

The nature and object of this invention are to produce a machine for simultaneously cutting and expanding slashed metallic screening in a cheap and efficient manner. ✕

Figure 1 is a front view of the machine, showing a piece of metal in the machine, part of which is cut and expanded. Fig. 2 is a rear view of the machine. Fig. 3 is an end view of the machine. Fig. 4 is a transverse sectional view of machine. Fig. 5 is a plan view of the device for feeding the metal into the machine, and in connection therewith a number of cutters are shown in their proper position. Fig. 6 is a front view of device shown in Fig. 5. Fig. 7 is a transverse sectional view of device shown in Fig. 5. Fig. 8 is a transverse sectional view showing the feeding device in connection with the longitudinal sliding head and lower cutters attached thereto. Fig. 8ª is a detail showing frictional roller in guide-bar. Fig. 9 is a perspective view of a segment of the feeding device. Fig. 10 is a plan view of a segment of the longitudinal sliding head carrying lower cutters. Fig. 11 is a front view of segment of longitudinal sliding head, showing lower cutters in position and the means for securing them to said sliding head. Fig. 12 is a perspective view of one of the cutters. Fig. 13 is a perspective view of a piece of metal, part of which is formed into slashed metallic screening. Fig. 14 is a perspective view, looking from the delivery end of the machine, showing the lower sliding head, cutters, and feeding device.

Similar letters of reference refer to similar parts in the different figures.

The novel features of this invention relate to the feeding and cutting device.

A in Figs. 4, 5, 8, 10, 11, and 12 shows the form of the cutters.

B, Fig. 12, is a stock secured to or integral with each cutter.

C is a clamp for clamping the stock B of cutters A. This clamp is formed of an upper and lower jaw drawn together by suitable bolts. One jaw of this clamp is cut into segments for the purpose of easily removing the cutters, as shown at D, Figs. 8, 10, and 11. There are two of these clamps, each similarly constructed, one of which is secured in the upper part of the lower cutter-head and the other to the lower part of the upper cutter-head, as shown at C, Fig. 4.

E, Figs. 4, 8, 11, and 14, shows a recess in lower cutter-head, through which access is obtained to the nuts of the bolts employed for drawing the jaws of the clamp together. Said bolts also secure the clamp to the said longitudinally-traveling head.

F, Figs. 8 and 11, is a filling-piece placed in said recess E for the purpose of supporting the parts, and is held therein by suitable bolts.

G G in Figs. 1, 2, 4, 8, and 10 are adjusting-screws which pass through the upper part of the longitudinally-traveling head, as shown in Fig. 8, and the lower part of the vertically-traveling head, as shown in Fig. 4, and bear against the stocks B of the cutters for the purpose of adjusting the cutters. These cutters A A are placed edge to edge, their vertical faces being offset in step form, as shown in Figs. 10 and 11, and being of uniform size, each cutter can be adjusted at pleasure by the screws G.

I I, Figs. 4, 5, 6, 7, 8, 9, and 14, are two bars parallel with bar N and fastened to the machine, one of which bars, having the flange J, (see Figs. 8 and 9,) serves to guide the metal to be cut and expanded. To these two bars are secured caps K and shoes L by bolts passing through them, which hold them firmly in position. Caps K carry dogs M, Figs. 5, 6, and 13, which are used to lock the metal in position while it is being cut and expanded.

N, Figs. 5, 7, 8, 9, and 14, is a longitudinally-traveling bar located at rear of bars I I, and carrying caps O O and shoes P, Figs. 5, 6, 7, 8, and 9, said caps and shoes being secured respectively above and below said bar N by suitable bolts, one set of said bolts passing through the space K between bars I I. This bar N travels longitudinally with its dogs Q, Figs. 5, 6, and 14, and is given a lateral movement

+ Here follow diagrams marked pp. 455 to 461) by the cap-bolts which pass through slot or space R, Figs. 5, 7, 8, and 9, these slots diverging from the face of the flanged bar I in the direction of the forward travel of the bar N.

S, Figs. 5, 7, 8, and 14, is a parallel bar, to which are connected at their upper ends the dogs Q.

T, Figs. 6, 7, 9, and 14, are stops against which the dogs Q strike in their backward movement.

U, Fig. 7, is a friction roll or slide to prevent wear upon the bolts, securing caps O and shoes P to bar N in their longitudinal travel.

Bars N and I I are set down in the cut-away part of shoes L and P for the purpose of allowing flange J to extend outwardly from the guide-line, so that the end of the metal feeding over said shoes will be supported thereby in its forward travel.

V, Figs. 1, 2, and 3, is a rotary cam actuating the parallel bar S backward and forward, and is worked by gears X X, operated from the main shaft.

Figs. 6 and 4 show the parallel bar S in its forward position, with its feed-dogs Q thrown against screw W in dogs M, causing said dogs to lock the metal between them and their shoes L. It is while the dogs are all in this position that the cutters operate on the metal.

Z, Figs. 1, 2, and 3, is a bracket supporting and forming guide for end of parallel bar N below the rotary cam.

H H, Figs. 8, 10, and 14, are wedge-shaped pieces which govern the lower sliding head in its lateral movement, causing it to travel parallel with the face of the cutter.

A, Fig. 14, is an upper cutter, shown in its position relative to the lower cutters before the act of cutting begins.

The bar E′, Fig. 1, is connected at its upper end with the upper vertically-moving cutter-head, C′, at the point F′. The bar E′ works in bearings at its lower end. On this bar E′ is the boxing I′.

J′ is a bent lever working on fulcrum K′. At one end it works in a rear boxing, I′. At the other end it is connected to link L′. The other end of this link is attached to and reciprocates the lower cutter-head. The adjusting-screws W, Figs. 5, 6, and 14, are attached to one set of dogs forming bumpers for locking one set.

M′, Fig. 1, is a clutch operated by means of lever beneath it, and used for the purpose of throwing the machine in and out of gear.

N′ N′ are tight and loose pulleys on the counter-shaft of the machine. O′ O′ are fly-wheels on said counter-shaft.

The movements and purposes of this machine are accomplished as follows: Power is conveyed to the machine by a belt running on the tight pulley on the counter-shaft, on which are secured fly-wheels O′ O′ and a spur-gear, the latter meshing with the large gear P′, which runs loosely on main shaft A′. The clutch M′, when thrown into connection with the large gear, operates the shaft A′, which, by means of eccentrics D′ D′, connected by straps and rods to cutter-head C′, gives the latter the requisite vertical movement. At F′ is connected the bar E′, which by its upward and downward movement operates levers J′ and link L′, which latter being connected to the lower longitudinally-sliding head Q′, gives to it its requisite movement. Gears X X, Fig. 3, rotate the cam V, which is secured to one of said gears, said cam giving a longitudinal back and forward movement to parallel bar S, which, being connected to the upper ends of feeding-dogs Q Q, (shown in Figs. 5, 6, 7, 8, and 14,) causes them to lock the metal to be cut between their lower serrated faces and their shoes P, and moves the dogs and the metal thus locked forward the requisite distance, and when about at the end of the forward travel said dogs are brought against the heads of the adjusting-screws in the other set of dogs, causing them also to firmly hold the metal between their lower serrated faces and their shoes, and to hold this interlocked position by means of a dwell on cam V, passing along roller B′, said roller being secured to the bar S. When these dogs remain in this position, the act of simultaneously cutting and expanding the metal is performed, the cutters in the vertically-traveling head-piece passing through the metal, their beveled faces following the beveled faces of the cutters in the lower longitudinally-traveling head Q, which is moved by the bent lever and link connection J′ and I′. When the cutters on the vertically-moving head have passed the lower cutters the requisite distance, the cam quickly returns the parallel bar S, causing bumper T (shown in Fig. 6) to strike against the head of the opposite screw, causing the locking-dogs M M to loose their hold on the metal. While this backward movement of bar S is being performed, the eccentrics D′ D′ being at or about the lowest point of their throw, the cutter-head C consequently has but little movement and the cutters hold the metal in position while the feeding-dogs are making their backward movement. The cut-away part of cam V permits the feeding device to lie dormant while the vertically-traveling head C′ passes upward sufficiently far to clear a space between the cutters, when levers J′ and link L′ operate to return the lower cutter-head to its former position after cam V again has caused another forward feed movement of bar S. The dogs Q Q in their backward and forward movement are also given a side movement corresponding with slightly-angular facings of sides of parallel bars I I (indicated by R) and collar U, fitting therein between said bars, the object being to give a draw movement to the feeding-dogs, and thereby cause the metal to travel closely along the bar I and guide-line J, and to prevent the cutters from drawing the metal away from said line.

It will be observed that wedges H H, Figs. 8 and 10, are a device for imparting the side or lateral movement of lower cutter-head, the lower part of same being secured to lower bed of machine and the upper part to the sliding head, the purpose of this being to cause said cutters to travel backward and forward parallel with their faces. The inclination of the wedges H H is determined by the angle at which the lower cutters are set. The faces of the upper cutters are set to correspond with the faces of the lower cutters, and consequently fit into the lower cutters in their travel. The object in having a lateral travel to the lower head is that the cutters in the vertically-traveling head may be immediately beneath and in line with the main shaft of the machine.

The bars I I may be made in one piece and slotted to accomplish the same purpose.

I claim—

1. In a machine for manufacturing slashed metallic screening, the combination of two cutter-heads with cutters in each head being set edge to edge, and their faces being set at an angle with each line of said cutters in step form and adjustable backward and forward in the angle in which they are set.

2. A movable cutter having a center stock and four cutting sides, two of said cutting sides being parallel with each other and oblique to the other two cutting sides.

3. In a machine for manufacturing slashed metallic screening, the combination of fixed guide-bars provided with spaces or slots within, through, or between them, said spaces or slots diverging in a greater or less degree from the line of the guide in said bars in the direction of the feed, with suitable feeding mechanism.

4. In a machine for manufacturing slashed metallic screening, the combination therewith of an intermittent feeding device, consisting of an actuating-bar loosely attached to one end of one or more locking-dogs, said dogs being loosely secured at or near their centers to journals and clamping against jaws at their opposite ends, said journals and jaws being securely attached one above the other to a bar or bars connecting the requisite number of said journals and jaws, all of said parts being held in their respective positions by a guide-bar fixed to the main frame of the machine.

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(No Model.) 4 Sheets—Sheet 1.

465

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MACHINE FOR SLITTING METALLIC SHEETS FOR METALLIC LATHING.

No. 385,405. Patented July 3, 1888.

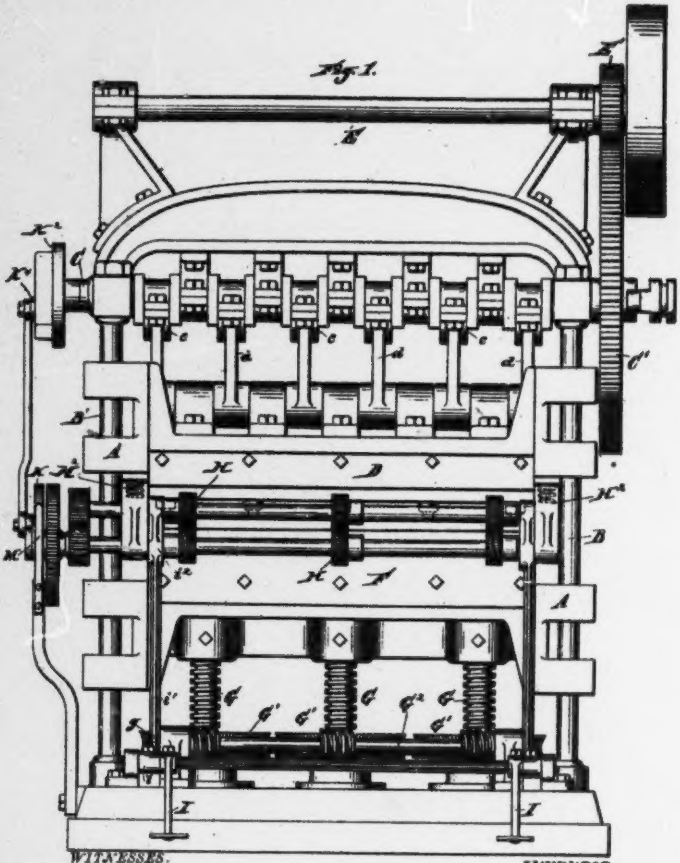
Fig. 1.
E'
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d
C'
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A
K
K³
H
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H²
M'
i²
F
i'
G
G'
G²
I

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W. B. Dougherty.

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By W. C. Fagan.

Attorney.

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Em Co. }

466 (No Model.) 4 Sheets—Sheet 2.

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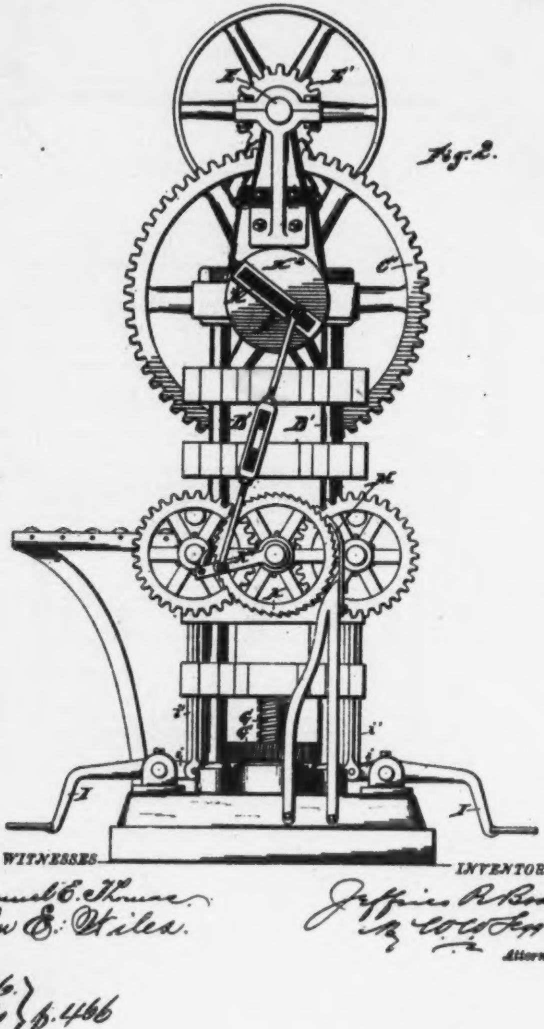
MACHINE FOR SLITTING METALLIC SHEETS FOR METALLIC LATHING.

No. 385,405. Patented July 3, 1888.



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No. 606.
G. F. C.
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467 (No Model.)

4 Sheets—Sheet 3.

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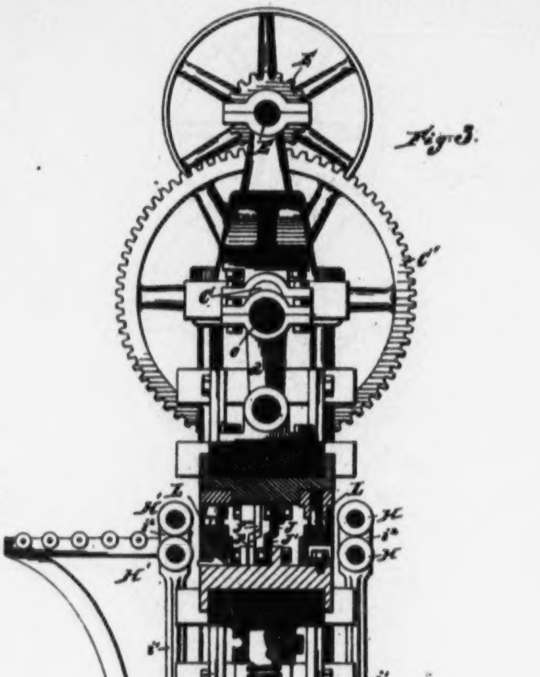
MACHINE FOR SLITTING METALLIC SHEETS FOR METALLIC LATHING.

No. 385,405 Patented July 3, 1888.



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468 (No Model.) 4 Sheets—Sheet 4.

J. R. BRANDEN.

MACHINE FOR SLITTING METALLIC SHEETS FOR METALLIC LATHING.

No. 385,405. Patented July 3, 1888.

Fig. 4.

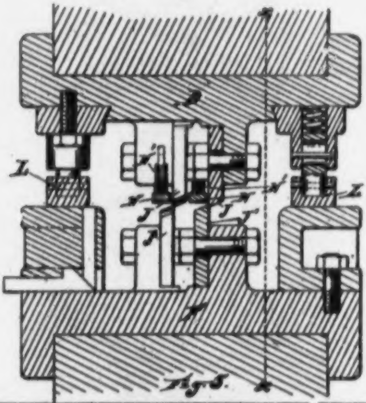
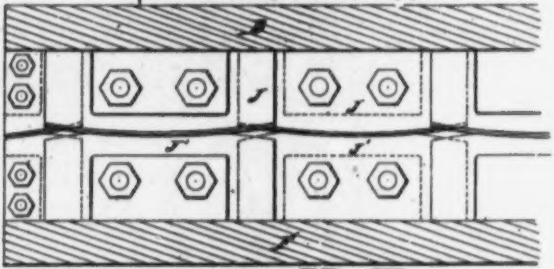


Fig. 5.



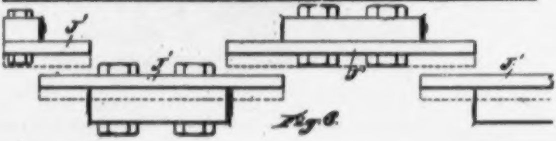


Fig. 6.

WITNESSES.

John E. Wiles.
M. B. Ologheety.

INVENTOR.

Jeffries R. Branden
By W. O. Leggett,
Attorney

No. 606
G. P. Co
vs
Em. Co } p 468

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UNITED STATES PATENT OFFICE.

JEFFRIES R. BRANDEN, OF DETROIT, MICHIGAN, ASSIGNOR TO CHAS
HODGES AND HENRY C. HODGES, OF SAME PLACE.

MACHINE FOR SLITTING METALLIC SHEETS FOR METALLIC LATHING.

SPECIFICATION forming part of Letters Patent No. 385,405, dated July 3, 1888.

Application filed February 17, 1888. Serial No. 264,[illegible]. (No model.)

To all whom it may concern:

Be it known that I, JEFFRIES R. BRANDEN, a citizen of the United States, residing at Detroit, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Machines for Slitting Metallic Sheets for Metallic Lathing; and I declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention consists of the combinations of devices and appliances hereinafter specified, and more particularly pointed out in the claims.

This invention relates more particularly to the manufacture of sheet-metal lathing such as is shown and described in the Letters Patent to Israel Kinney, No. 312,864, dated February 24, 1885, and more particularly to the mechanism for performing the operation of slitting the sheet of metal prior to corrugating the same.

In the drawings, Figure 1 is a front elevation, Fig. 2 a side elevation, and Fig. 3 a longitudinal section, of a machine embodying my invention. Fig. 4 is an enlarged sectional view from front to rear. Fig. 5 is an enlarged view from end to end, illustrating the cutting-knives; Fig. 6, a plan view of the cutting-knives, illustrating their arrangement.

In carrying out the invention, A represents a suitable frame.

B B' are uprights which support the cam-shaft C, and serve as guides for the platen D, that carries the upper or traveling knives. The cam-shaft is engaged with the drive-shaft E by any suitable gearing, C' E'.

F is the lower platform, which supports the lower knives, and this is adjustable up and down by jack-screws G, worm-gears G', and shaft G², the latter being provided with an arbor, *g*, for the reception of an operating-crank.

H H' are friction feed-rollers at the entrance and exit ends of the machine, between which the sheet of metal is fed. Those at the exit end are a shade larger than those at the entrance end, to compensate for the slight elongation of the sheet, due to the process of slitting, and prevent the same *from* buckling when engaged with the feed-rollers at both the entrance and exit ends of the machine. It is also apparent that if these rolls were not slightly larger than those at the entering end of the machine the sheet when once engaged with these emerging feed-rollers would elongate toward the rear slightly at each end and result in making the spaces between the successive lines of slits to grow less and less by this degree of elongation. By making these emerging rolls a little longer, however, as explained, just enough to compensate for said elongation, it is apparent that the feed of the sheet past the knives is made regular and uniform.

A treadle, I, with its connecting mechanism *i i' i²*, serves as a means either at the entrance or exit end of the machine to open the upper friction-roller from the lower for entering or removing the sheet. The rollers are held to their work by the springs H² above their journal-bearings.

J are the upper and J' the lower knives. These knives are adapted to shear past each other, so as to sever the metal by a shearing cut. It is preferred that they shear from the middle toward the ends, and they are therefore convexed from end to end, as shown. To make the slits longer or shorter, it is only necessary to adjust the lower platform farther from or nearer to the upper platform, for the higher the lower platform the greater will be the distance that one knife passes the other, and consequently the longer will be the slits.

The feed of the sheet is effected by the ratchet feed-wheel K and lever K'. The throw of the lever determines the amount of the feed, and this throw is regulated by the feed-screw K² on the disk K³. The screw adjusts the distance of the wrist-pin K from its center of motion, and so determines the throw of the lever K'. In this way the feed of the sheet between each descent of the knives and the next succeeding descent is made just twice the distance between two adjacent lines of slits, so that in the finished sheet the successive lines of slits shall be spaced equally throughout.

If it is desired to make the spaces between the slits wider or narrower, each set of knives may be arranged to be adjusted forward or back by means of set-screws or other suitable

+ (Here follow diagrams marked pp. 465 to 468) means and the feed be regulated to correspond, as above explained.

L represents spring-grips, which as the upper platen descends come into contact with and securely hold the sheet during the operation of the knives and maintain their hold until the knives have risen free from the plate. The further lift of the platen raises the grips and the sheet is again free to be fed forward by the feed-rollers.

A spring-pawl, M, or other convenient device may be employed, if desired, to prevent recoil of the ratchet feed-wheel.

Of course it will be understood that the product of the machine may be for the manufacture of lathing, fencing, or anything to which a sheet of any thickness thus cut may be employed, and the adjacent slits in each line may or may not be of equal lengths.

The knives are arranged in pairs so that each alternate pair stands in advance of and breaks joints with the two adjacent pairs, each series serving to cut a line of slits across the sheet-breaking joints with the slits in the line cut by the other series of knives.

The upper platen is given its motion up and down by pitmen *d*, which at their upper ends engage eccentrics *c* upon the cam-shaft C.

N represents freeing-knives. They are located in position above the sheet and are provided with spring-cushions N'. They are designed to strip the metal from the knives in case the same should cling to the knives.

What is claimed is—

1. In a slitting-machine for slitting metallic sheets for the manufacture of lathing, &c., the combination of a lower platform bearing stationary knives corresponding with two lines of slits, those in one line breaking joints with those in the other, an upper reciprocating platen bearing the companion knives of the lower set, driving mechanism for reciprocating the platen, and feeding mechanism adapted to automatically feed the sheet, substantially as described.

2. In a slitting-machine for slitting metallic sheets for lathing, &c., the combination of an upper reciprocating platen with means for reciprocating the same, a lower platform with means for adjusting the same to a higher or lower level, said platen and platform provided with companion knives corresponding with two adjacent lines of slits, and automatic feeding mechanism for feeding the sheet, substantially as described.

3. In a machine for slitting a metallic sheet for the manufacture of lathing, &c., the combination, with an upper reciprocating platen, lower adjustable platform, and knives corresponding with two adjacent lines of slits, of feed-rolls between which the sheet is fed, means for operating said rolls, and an adjustable crank for regulating the amount of feed, substantially as described.

4. The combination, with the upper platen and lower platform and their knives, of feeding mechanism for automatically feeding the sheet, and spring-grips L, constructed to engage and hold the sheet during the operation and retraction of the knives, substantially as described.

5. The combination, with the platen, the platform, and their knives, of the feed-rollers, springs for pressing the upper roller against the lower, and mechanism for separating the rolls, substantially as described.

6. The combination, with the cutting-knives, of the feed-rollers at the entrance and exit ends of the machine, those at the exit end made a shade larger than those at the entrance end, substantially as and for the purposes described.

7. The combination, with the knives, of the freeing-bars N, constructed to strip the metal from the knives, substantially as described.

In testimony whereof I sign this specification in the presence of two witnesses.

JEFFRIES R. BRANDEN.

Witnesses:

M. B. O'DOGHERTY,
JOHN E. WILES.

471 N.Y.Cob
G.F.Co
E.M.Co } p.471

(No Model.)

A. EKSTROM.

MACHINE FOR MAKING METALLIC LATHING.

No. 385,663. Patented July 3, 1888.

Fig. 1.

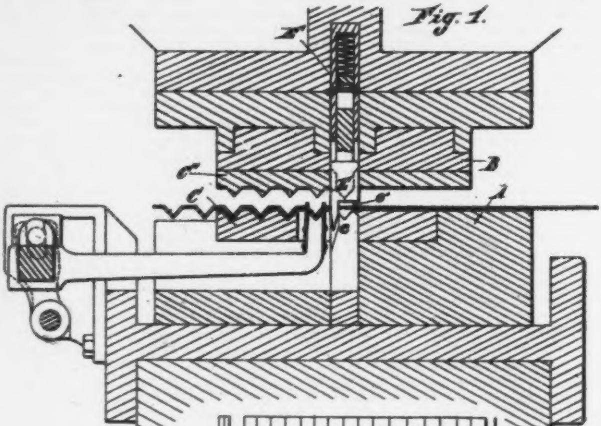
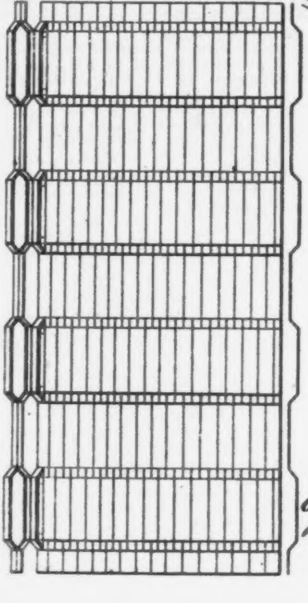


Fig. 2.



WITNESSES
John E. Wiles.
Wm. B. Dogherty

INVENTOR.
Anton Ekstrom
By W. W. Leggett.
Attorney.

UNITED STATES PATENT OFFICE.

ANTON EKSTROM, OF DETROIT, MICHIGAN, ASSIGNOR TO HENRY C. HODGES AND CHARLES C. HODGES, OF SAME PLACE.

MACHINE FOR MAKING METALLIC LATHING.

SPECIFICATION forming part of Letters Patent No. 385,663, dated July 3, 1888.

Application filed February 17, 1888. Serial No. 264,330. (No model.)

To all whom it may concern:

Be it known that I, ANTON EKSTROM, a citizen of the United States, residing at Detroit, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Metallic-Lath Machinery; and I declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention consists of the combinations of devices and appliances hereinafter specified, and more particularly pointed out in the claims.

In the drawings, Figure 1 represents a cross-sectional view of a part of an opening-out machine illustrating my invention. Fig. 2 is a plan view of a slitted and corrugated sheet which has been partially opened out by the opening-out machine, and showing the locality where my improvement is employed.

This invention is designed as an improvement upon what is termed the "opening-out machine" in the manufacture of metallic lathing—such as is shown and described in Letters Patent to Israel Kinney, No. 312,864, dated February 24, 1885—the said machine, with the exception of my improvement, being illustrated and described in an application for Letters Patent by Jefferies R. Branden, filed of even date herewith, Serial No. 264,343. In the said Branden opening-out machine the metal is fed forward by a forked arm which engages the metallic strip that has just been folded by the folding-dies and moves it forward one space, the design being to leave the next adjacent strip in exact position to be folded by the next descent of the folding-dies. In practice, however, it has been found difficult to properly locate the said strip by the said forked feeding-arm, and it is the purpose of my invention to produce mechanism for exactly lining the new strip to be folded by the folding-dies.

In carrying out my invention, A represents the lower platform and B the upper platform; C and C', the lower and upper folding-dies, respectively.

All the foregoing mechanism and all the general features of the machine are the same as described and shown in the said application of Branden, and are not therefore again reproduced.

I will now proceed to describe the particular feature of my invention.

E is what I term a "liner." It is provided with a finger, *e*. There may be any number of these liners arranged across the platen. The purpose of these liners is as follows: When the feeding mechanism has fed the sheet forward one space it may or may not be in exact position to receive the next action of the folding-dies; but as the platen descends the fingers *e* will pass into the opening between the last slit that was folded and the new slit to be folded, and will adjust the sheet to its exact particular position for the action of the folding-dies. In this way any slight irregularity in the feeding mechanism or any slight distortion of the sheet is compensated by these liners, which not only adjust the sheet to its proper position, but hold it in that position during the action of the dies. These liners may be made stationary; but I prefer to provide each liner with a spring-cushion, E', so that as the dies separate, the fingers may be projected well beneath the platen, so as not only to be in position to enter and adjust the sheet prior to the dies coming together, but to serve also to prevent the sheet from lifting as the dies separate, which it might do in some cases by reason of the metal clinging to the dies.

Each liner is provided with a ledge, *e'*, which projects out laterally from the base of the finger *e*. It extends across the strip that is to be folded, and holds it against displacement as the dies are coming together. The metal is thus prevented from creeping out at one side or the other—a tendency which is always present when thin sheet metal is being thus acted upon.

Having thus described my invention, what I claim is—

1. In an opening-out machine for opening out and finishing metallic lathing, &c., the combination, with the folding-dies, of lining-fingers *e*, said fingers connected with a traveling platen and adapted upon its descent to enter between the last-folded strip and the strip next to be folded, and adjust and hold the sheet

* (New follows diagram marked P. 471)

in proper position for the folding-dies, substantially as and for the purposes described.

2. In an opening-out machine for opening out and finishing metallic lathing, &c., the combination, with the folding-dies, of lining-fingers *e*, connected with the traveling platen, and in connection with said liners springs for projecting the liner beneath the platen and serving as cushions against which the liners may react as the dies come together, substantially as described.

3. In an opening-out machine for opening out metallic lathing, the combination, with the folding-dies, of a finger adapted to grasp and fix in exact particular position the metal for the dies, said fingers provided with a projecting ledge adapted to extend across the strip to be folded, thereby holding the same against displacement as the dies come together, substantially as described.

In testimony whereof I sign this specification in the presence of two witnesses.

ANTON EKSTROM.

Witnesses:

M. B. O'DOGHERTY,
JOHN E. WILES.

474
(No Model.)

I. S. ELKINS.

METAL LATHING.

No. 408,599. Patented Aug. 6, 1889.

Fig. 1.

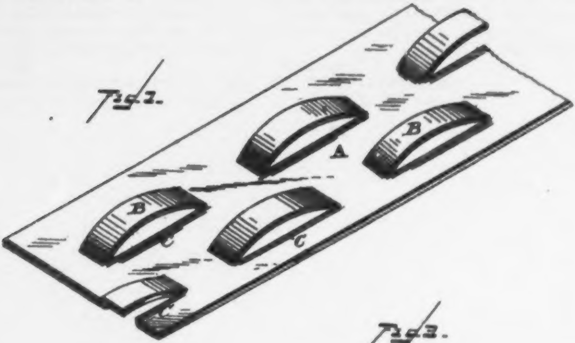


Fig. 2.

Fig. 3.

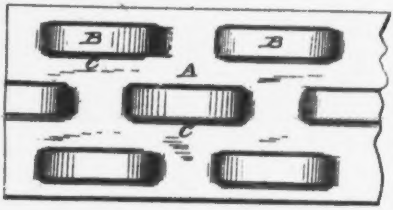


Fig. 4.

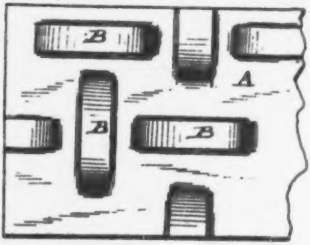
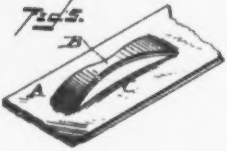


Fig. 5.



WITNESSES:
F. L. Ourand
L. Deane

INVENTOR:
Ira S. Elkins.

By J. S. Zerk
Attorney.

No 606
G. F. Co } p. 474
Elk Co

UNITED STATES PATENT OFFICE.

IRA S. ELKINS, OF NEW YORK, N. Y.

METAL LATHING.

SPECIFICATION forming part of Letters Patent No. 408,509, dated August 6, 1889.

Application filed April 22, 1889. Serial No. 308,103. (No model.)

To all whom it may concern:

Be it known that I, IRA S. ELKINS, of New York, in the county of New York and State of New York, have invented a new and useful Improvement in Metal Lathing, which improvement is fully set forth in the following specification and accompanying drawings, in which—

Figure 1 is a perspective view of my improved metal lathing. Fig. 2 is a cross-section showing one of the loops; Fig. 3, a top view showing the disposition of the loops over the surface of the metal; Fig. 4, a top view showing a modified form of placing the loops; and Fig. 5, a view showing a modified construction of the loop.

The object of this invention is to provide a simple, easily-manufactured metal lathing, so constructed that it will require the smallest possible amount of mortar, and which will form a strong durable wall when in position, and is so made that it can be readily utilized for brackets, cornices, or other purposes, as well as for plain plastering purposes.

It consists in having the lath made of sheet metal with loops drawn up at regular intervals over its face, and in further providing the edges of the slots, from which the loops are drawn, with upwardly-turned flanges, whereby the mortar is provided with rounded faces on the back side of the sheet, so as to prevent cutting of the back clinch, all of which will now be set forth in detail.

In the accompanying drawings, A represents the sheet of metal, of any suitable gage and size. In this sheet I cut parallel slits in pairs, at regular intervals, so that the rows alternate, as shown in Fig. 3. The body of the metal between the slits is then drawn forward or upward by suitable dies, so as to form loops B. The outer surfaces of these loops are slightly rounded, as shown. All the loops are on the face side of the plate, or on the side to which the mortar is applied, thereby furnishing a plain smooth back face to the plate, enabling it to be snugly fitted to the joist or studding.

Each of the slitted edges of the body of the plate is flanged, as shown at C—that is, the edge adjacent the slit is turned outwardly or forwardly, so as to form a rounded edge on the rear side, as shown at D, Fig. 2. The flanging of these edges serves a double purpose, first, to prevent too great a waste of mortar through the openings between the loop and slitted edge of the metal, and, second, to form a rounded edge, against which the clinching-tongue of the mortar can rest without being cut off, as would otherwise be the case, by its own weight. The loops thus constructed form arches over the entire surface of the plate, making it very rigid, and greatly adding to the strength of the plate. As the loops are directly over the openings from which they are drawn, only a comparatively small amount of mortar will pass through the openings, thus effecting a great saving in the amount of mortar used, as compared with wood or wire lathing, and requiring much less mortar than is used on any other form of metal lathing which depends on open work to secure the clinch.

While I prefer the disposition of the loops as shown in Fig. 3, it is obvious that the loops may be placed at right angles to each other, as shown in Fig. 4. It is obvious that by placing the loop in this way the plate becomes trussed in both directions, an advantage not obtainable where the loops are in rows, as shown in Fig. 3. For certain purposes, and especially where no bending of the plate is required, the right-angled disposition of the loops is preferable.

I prefer having the loops of equal width throughout, as shown in Figs. 1 and 3; but instead of having them thus made the loops may be narrowed in the middle, as shown in Fig. 5. This provides wider upturned flanges at the sides of the loop, which may be an advantage for certain kinds of work, especially where a heavy coating of mortar is desired on the walls.

What I claim as new is—

1. A metal lath consisting of a piece of metal formed with a series of pairs of parallel slits arranged at suitable intervals, and having the body of the metal between the slits of each pair drawn forward or upward to form loops, all upon the same side of the sheet, and the edges of the slits adjacent to the loops being provided with forwardly or upwardly turned flanges.

2. A sheet-metal lath having loops made

+(Here follows diagram marked p. 474)

in its face, arching over the openings thus formed, the edges of the openings having upward flanges, substantially as specified.

3. As a new article of manufacture, a sheet-metal lath having loops made at regular intervals over its entire surface on one side only, and upwardly or forwardly turned flanges along the edges of the said openings, substantially as described.

4. A metal lath having expanded loops on one side only, the said loops covering or arching over the openings from which the loops are formed, substantially as described.

In testimony that I claim the foregoing I have hereunto set my hand this 1st day of January, 1889, in the presence of witnesses.

IRA S. ELKINS.

Witnesses:
J. S. ZERBE,
LOUIS ITSCHNER.

477

(No Model.)

C. KINNEY.
METALLIC LATHING.

No. 432,141 **Patented July 15, 1890.**

Fig. 1.

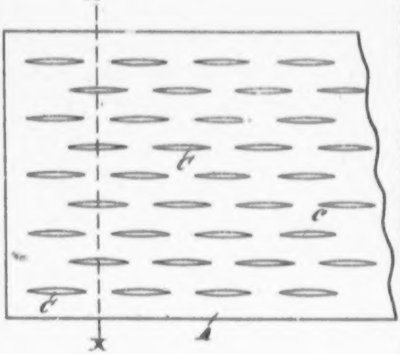


Fig. 2

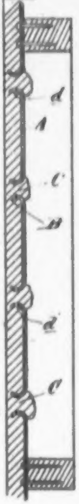


Fig. 3.

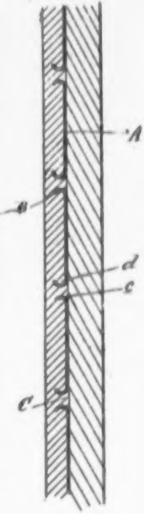
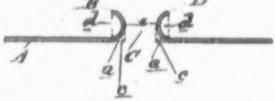
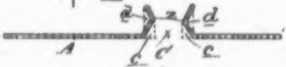


Fig. 4.



B
B
d
d
A
a
C
a
c
c

Fig. 5.



Witnesses

Geo. A. Gregg

A. J. Hamilton

Inventor.

Cyrus Kinney.

By Theo. S. Sprague & Son

Atty.

Nc. Cob. I. F. Co. v. Ewel } pa 477

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UNITED STATES PATENT OFFICE.

CYRUS KINNEY, OF WINDSOR, ONTARIO, CANADA.

METALLIC LATHING.

SPECIFICATION forming part of Letters Patent No. 432,141, dated July 15, 1890.

Application filed July 22, 1889. Serial No. 318,223. (No model.) Patented in Canada August 5, 1889, No. 32,005.

To all whom it may concern:

Be it known that I, CYRUS KINNEY, a citizen of Great Britain, residing at Windsor, in the Province of Ontario and Dominion of Canada, have invented certain new and useful Improvements in Metallic Lathing, (for which I have obtained a patent in Canada August 5, 1889, No. 32,005,) of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to new and useful improvements in metallic lathing; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being made to the accompanying drawings.

My invention relates to that class of metallic lathing in which there are openings cut in sheet metal to form lips, which are bent to form keys to retain the plaster; and the invention consists in the peculiar style of openings hereinafter described, and then definitely pointed out in the claim.

In the drawings which accompany this specification, Figure 1 is a plan of my improved lathing. Fig. 2 is a section thereof on line $x x$, being shown as applied to studding. Fig. 3 is a similar section showing the lathing applied to a flat surface. Fig. 4 is a section through a single aperture enlarged. Fig. 5 is a similar section through a modification of the aperture.

To construct my lathing I take a sheet of metal A, and by any suitable means—such as male and female dies and rollers—I produce apertures preferably of the shape shown and of such width as to force the edges or lips of the aperture out from the face of the metal and leaving the aperture C therethrough. In producing the apertures I use dies of such shape as to form a rounded shoulder a (see Fig. 4) at the base of the lips and the outwardly-extending points B, thus forming a key or clinch for the mortar in the spaces c d. (Shown in dotted lines.) The rounded corners, above referred to, run from the plane surface of the back of the lath to about the middle of the lips, forming preferably a curve of about the fourth of a circle, and the spaces d are formed between the rounded corners and the extreme edges of the lips, or on the concave face of said lips.

It is evident that when the lathing is put upon studding the mortar will pass through the apertures, as shown in Fig. 2, clinching upon the opposite sides, while the keys, extending outwardly, will also act as a support and a key for the mortar in the spaces d.

When the lathing is put upon a flat surface, as shown in Fig. 3, the spaces c and d act as the keys and hold the mortar firmly in position equally as well as when studding is used.

I preferably stagger the apertures, as shown in Fig. 1.

My lathing may be cut at any point and nailed to its support in the spaces between the apertures without detracting from its strength. This result it has been impossible to accomplish with other lathing produced by stretching the sheet apart at the apertures or bending the spaces at an angle to the sheet. It also adds to the stability of a structure to which it is applied, as well as adding to the fire-proof qualities of a building.

It will be seen that in both of the forms shown in Figs. 4 and 5 the mouth of the opening through which the mortar enters is larger than at a point at z about midway through the opening. This admits of the mortar readily entering the opening, while the enlarged part of the opening back of the midway point forms a space that will securely hold the keys, whether the lath be laid upon studding, as in Fig. 2, or be laid upon a flat surface, as in Fig. 3. It will also be seen on examining Fig. 1 that the openings are of a narrow and elongated O shape, having pointed ends and arranged to break joints, with continuous lips along the edges of the openings. By this construction the metal is but slightly weakened, if at at all, by the cutting and formation of the lips, inasmuch as the lips when formed serve to strengthen or stiffen the sheet; but when the sheet is so cut as to leave right-angled apertures, as heretofore proposed, it is much weakened at the ends of the apertures by the small amount of metal severed or removed at these points.

+ (Here follows diagram marked p. 477)

What I claim as my invention is—

A sheet-metal lath provided with elongated O-shaped apertures having pointed ends and re-enforcing flanges or lips continuous upon the two sides of said aperture to hold the plaster, substantially as described.

In testimony whereof I affix my signature, in presence of two witnesses, this 15th day of June, 1890.

CYRUS KINNEY.

Witnesses:
Jas. Whittemore,
Ed. McBrearty.

368

480 No. 606 G. F. Co. Cin. Co. } p480

(No Model.)

L. L. SAGENDORPH.

METALLIC LATHING.

No. 447,085. Patented Feb. 24, 1891.

Fig. 1.

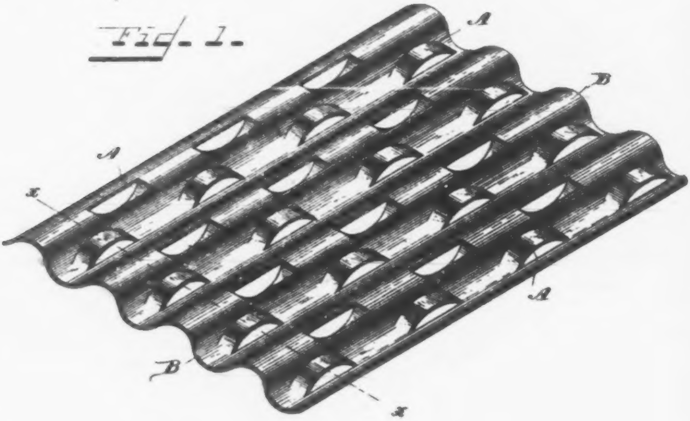


Fig. 2.

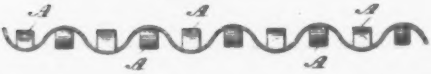


Fig. 3.

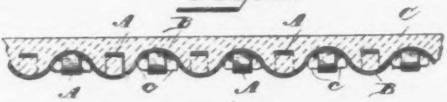
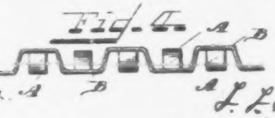


Fig. 4.



Witnesses:
Wilson B. Brice
H. F. Koking.

Inventor:
L. L. Sagendorph
per Stahli & Hill
Attorneys.

UNITED STATES PATENT OFFICE.

LONGLEY LEWIS SAGENDORPH, OF PHILADELPHIA, PENNSYLVANIA.

METALLIC LATHING.

SPECIFICATION forming part of Letters Patent No. 447,085, dated February 24, 1891.

Application filed October 4, 1890. Serial No. 367,061. (No model.)

To all whom it may concern:

Be it known that I, LONGLEY LEWIS SAGENDORPH, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Metallic Lathing, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

The object of my invention is to provide a metallic lathing-sheet so formed as to afford an ample and secure locking-surface for the mortar to adhere to and at the same time stiffen or strengthen the sheet, as will be apparent from the description hereinafter given.

In the accompanying drawings, Figure 1 is a perspective view of a portion of a lathing-sheet embodying my invention and as preferably constructed. Fig. 2 is an end view of the lathing-sheet shown in Fig. 1. Fig. 3 is a cross-section taken at the dotted line x x, Fig. 1, with the mortar applied thereto, illustrating the manner in which the plaster is keyed to the sheet. Fig. 4 illustrates a slight modification of my invention, being an end view of a portion of the sheet.

My improved metallic lathing consists of a sheet of suitable metal corrugated, with loops A cut and forced outward from the concave surface of each corrugation, as shown. It will be readily seen that both faces of my improved lathing are the same and are capable of being reversed. The loops A are formed by cutting a slit in the metal at each side thereof and forcing the metal outward between said slits, the apex of each loop preferably terminating below the apex of the main adjacent corrugations B, as shown. The corrugations B are preferably circular in outline, but may be formed V-shaped or rectangular, as shown in Fig. 4.

The plaster C may be applied to either face of the lathing-sheet, whichever face may chance to be outward when the sheets are applied, and secured to the walls or ceiling or other portion of the building designed to be plastered.

The advantages of my new and improved lathing are many and apparent. In the first place, a very secure lock or key is afforded for the plaster to adhere to, as will be seen by reference to Fig. 3. The plaster when applied to the sheet is forced in against the loops, which curve inward, said loops causing the plaster to spread out at each side thereof, as shown, and thus cause a secure lock at the rear side of the sheet, the plaster being locked around the loops, which curve outward, as shown in said figure, thus affording double security. The main corrugations or ribs B tend to stiffen and strengthen the sheet and at the same time permit of its being bent around girders or oval surfaces without impairing its locking qualities. The sheet of lathing thus formed is easily applied and handled, no sharp points or corners being present to lacerate the operator's hands.

The lathing aforedescribed is designed as an improvement on the lathing patented to me February 25, 1890, No. 422,318, and is superior thereto, on account of the locking-surface produced.

What I claim as new, and desire to secure by Letters Patent, is—

1. A corrugated lathing-sheet having loops cut and forced outward from the concave surface of each corrugation, as and for the purposes specified.

2. A corrugated metallic lathing-sheet having loops cut and forced outward in opposite directions in alternate corrugations, said loops at their end portions being integral with the body of the sheet, as set forth.

3. A corrugated lathing-sheet having loops or retaining portions cut and forced outward from the concave surface of each corrugation, the apex of each loop or portion terminating below the apex of the adjacent convex corrugations, substantially as set forth.

4. A corrugated lathing-sheet having loops cut and rounded outward from the concave surface of each corrugation, integral therewith and at right angles thereto, as shown and set forth.

LONGLEY LEWIS SAGENDORPH.

Witnesses:
SAMUEL D. HAGNER,
E. P. HOYT.

X (New Ballows diagram marked p 480)

482 [illegible] Co. } p4f2

(No Model.)

W. W. BOSTWICK.

METAL LATHING.

No. 459,625. Patented Sept. 15, 1891.

Fig. 1.

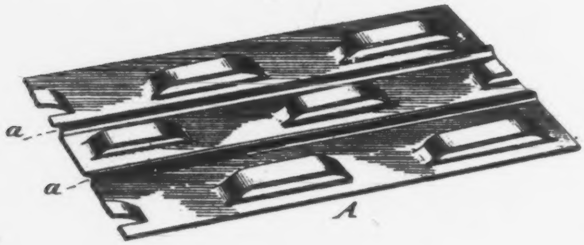
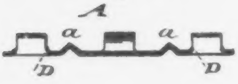


Fig. 2.



Witnesses:
A. Ruppert.
E. Cruse.

Inventor:
Walter W. Bostwick,
by Geo. W. T. Howard,
atty.

UNITED STATES PATENT OFFICE.

WALTER W. BOSTWICK, OF NEW YORK, N. Y., ASSIGNOR TO THE BOSTWICK METAL LATH COMPANY, OF SAME PLACE.

METAL LATHING.

SPECIFICATION forming part of Letters Patent No. 459,625, dated September 15, 1891.

Application filed June 27, 1890. Serial No. 356,980. (No model.)

To all whom it may concern:

Be it known that I, WALTER W. BOSTWICK, of the city, county, and State of New York, have invented certain new and useful Improvements in Metal Lathing, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 is a perspective view of my invention; Fig. 2, a cross-section.

The invention is designed to be an improvement upon that described in Letters Patent No. 408,599, granted August 6, 1889, to Ira S. Elkins, and intended to increase the rigidity and otherwise improve the construction therein described.

In the drawings, A represents a sheet of metal of any suitable gage and size. Parallel slits are made in pairs at regular intervals, so that the rows shall alternate, as shown in Fig. 1.

In the patent above mentioned a blank or flat space is left between the several rows of parallel slits; but in my invention I form a corrugation or ridge in such space, as shown by *a*, the purpose of which is to increase the rigidity of the plate and also add to the efficacy of the surface in holding or confining the mortar. Thus it will be seen that one side of the plate is indented by the formation of the loops and the corrugations, while the opposite side is raised at the loops and at the corrugations, the remainder of the plate on both sides being plain or flat. The general construction of the plate is the same as in the patent referred to, except that the corrugations are added; and the advantages pointed out in the patent are of course found in the present construction with the additional advantage of increased strength and rigidity, resulting from the corrugating of the plate.

One special advantage, aside from the increased strength and rigidity given by the corrugations, is that the mortar applied to the plate is crowded by the inclined sides of the corrugations under the loops, thereby anchoring the mortar and giving it a firmer hold upon the plate. While the loops are preferably of equal width throughout, they may, if desired, be made narrower in the middle, as shown in the patent referred to.

D represents an underrounded edge at each side of the opening where a loop occurs, forwardly or upwardly turned flanges being formed, as described in the patent, the objects of which are to prevent waste of and assist in anchoring the mortar.

I am aware that, broadly, it is not new to strengthen sheet metal by beading, ridging, or corrugating, and also that heretofore attempts have been made to strengthen sheet-metal lathing having loops but on both sides of the sheet by grooving the sheet transversely of the loops, and, further, as in the Elkins patent, No. 408,599, upon which my invention is an improvement, by placing the loops at right angles to each other; but such attempts have been unsuccessful, not only from the fact that they failed to impart strength to the sheet in the direction of the strain to which it is subjected, but also because of the difficulty, if not impossibility, of manufacturing such metal lathing by machinery in an economical manner.

Having described my invention, I claim—

A metal lath consisting of a sheet of metal having a series of parallel rows of projecting loops all on one side of the sheet and a series of ridges or corrugations extending between, parallel with, and longitudinally of the rows of loops, substantially as specified.

In testimony whereof I have hereunto set my hand and affixed my seal this 6th day of June, 1890.

WALTER W. BOSTWICK. [L. S.]

Witnesses:

W. J. MORGAN,

E. J. GRANGER.

(Here follows diagram marked p 482)

376

(No Model.)

2 Sheets—Sheet 1.

484

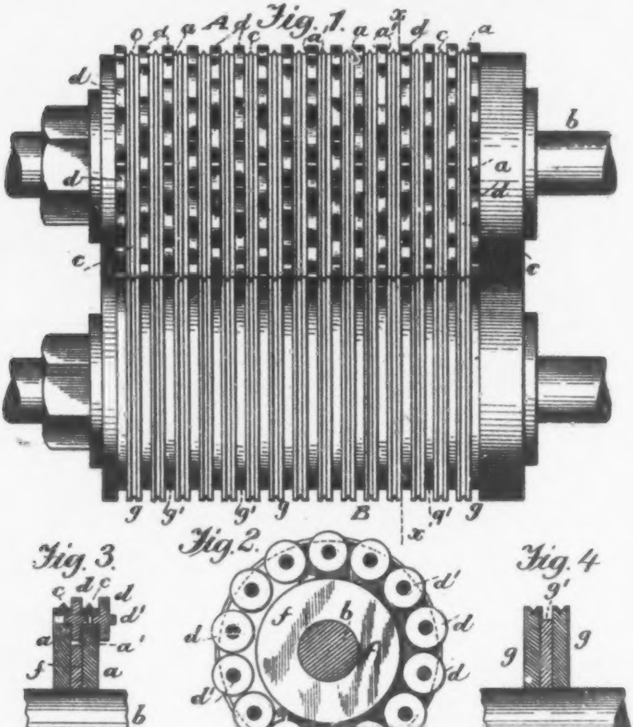
H. A. STONE.

MACHINE FOR PRODUCING METAL LATHING.

No. 459,726.

Patented Sept. 15, 1891.

Fig. 1.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d
a
A
d
c
a
a
a
x
d
c
a
d
d
b
a
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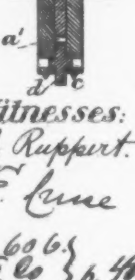
c
c
g
g'
g'
g
B
x
g'
g

Fig. 3.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d
d'
a
a'
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a'
d
c

Fig. 2.

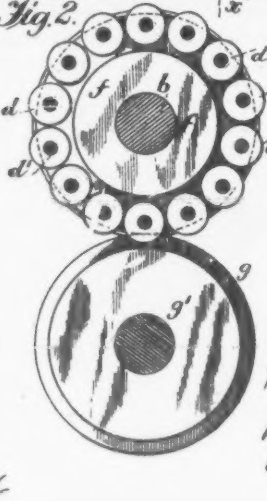
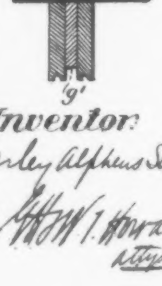


Fig. 4.



Witnesses:
A. Ruppert.
E. [illegible]

Inventor:
Harley Alpheus Stone,
by [illegible] Howard,
Attys.

No. 606. }
[illegible] Co } p. 484
[illegible] Co }

(No Model.) 2 Sheets—Sheet 2.

485

H. A. STONE.

MACHINE FOR PRODUCING METAL LATHING.

No. 459,726. Patented Sept. 15, 1891.

Fig. 5.

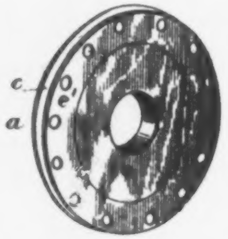


Fig. 6.

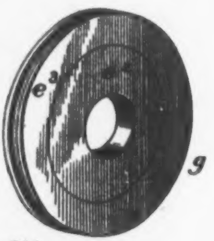


Fig. 7.

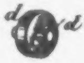


Fig. 8.

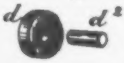
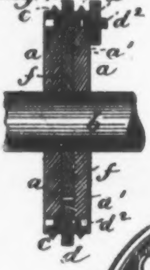


Fig. 9.


g
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a'
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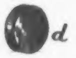
b
f
a
a'
d²
c
d

Fig. 10.



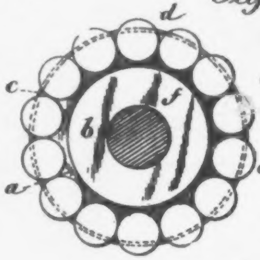


Fig. 11.

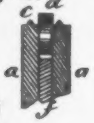


Fig. 12.

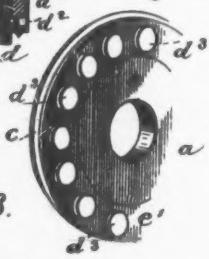
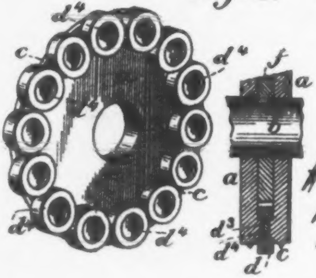


Fig. 13.


d⁴
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e'
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a
c
d
d⁴
d³
d⁴
d'
c

Witnesses:
A. Ruppert.
E. Cruse.

Inventor:
Harley Alpheus Stone,
by [illegible] W. T. Howard,
Attys.

No. 606. }
[illegible] } p485
Exc. }

UNITED STATES PATENT OFFICE.

HARLEY ALPHEUS STONE, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE BOSTWICK METAL LATH COMPANY, OF NEW YORK.

MACHINE FOR PRODUCING METAL LATHING.

SPECIFICATION forming part of Letters Patent No. 459,726, dated September 15, 1891.

Application filed April 28, 1891. Serial No. 390,309. (No model.)

To all whom it may concern:

Be it known that I, HARLEY ALPHEUS STONE, of the city, county, and State of New York, have invented certain new and useful Improvements in Machines for Producing Metal Lathing, of which the following is a specification, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention relates, generally, to that class of machines in which rotary male and female dies are employed, through or between which the sheet metal to be operated upon is passed, and more especially to a machine by means of which in such passage the sheet is slitted and given a series of loops projecting from one side of the sheet and corrugated or ribbed; and it consists in constructions and combinations of parts by means of which the operation of the machine is improved and the structure made more durable and less liable to become unfit to do good work, and whereby, further, certain of its operative parts when worn may be readily removed for the substitution of new parts, all as hereinafter specified. ✗

In the accompanying drawings, Figure 1 is a front elevation of a pair of rolls, each formed of a series of dies and other parts constituting my invention. Fig. 2 is a vertical transverse section through the line $x\,x$ of Fig. 1. Figs. 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, and 13 are details, as hereinafter described.

Similar letters of reference indicate similar parts in the respective figures.

The rolls are represented by A and B, respectively. The roll A comprises a series of disks *a*, centrally bored so as to fit mandrel *b*, each disk being provided with a circumferential projection or ribber *c*. The disks *a* are placed so as to leave a space a' between each adjacent pair, this space being occupied by a series of small circular cutters *d*, which may be journaled in the disk *a* in either of the ways illustrated in Figs. 3 and 9, Fig. 7 showing the cutter employed, in Fig. 3 and Fig. 8 that seen adjusted in Fig. 9.

In Fig. 7 the pin d' is solid with the cutter, while in Fig. 8 the cutter is perforated so as to be mounted on a pin d^2, carried by two of the disks *a*. The construction is such (see Fig. 9) that the pins do not extend through the disks *a*, in which they have their bearing, but only about half-way through, so that one disk shall serve to support one end of two pins. The cutters *d* can be made of steel, suitably hardened and tempered, to make them effective and durable.

In Figs. 12 and 13 a further modification is shown. Here each disk Fig. 12 is provided on one of its sides with a series of cylindrical projections d^3, while the cutter is given, Fig. 13, a cylindrical recess d^4 on each side.

Fig. 13 shows the adjustment, a cutter being supported by two disks. Each of the disks *a* is preferably made with its inner portion *e*, Fig. 5, of wrought-iron, with the outer portion e', of steel, welded thereto and hardened, so that the bearings in which the pins d' or d^3 rest and the ribber *c* shall be less liable to wear and the latter maintain its sharpened edge so as to produce a rib of proper form in the metal operated upon. It is of great importance that the ribber shall not be subject to wear and shall possess great durability, and heretofore much difficulty has been found in constructing a disk the ribber of which has possessed the qualities named. By constructing the disk in the manner described—that is to say, with the portion *e* immediately surrounding the mandrel—of wrought-iron, and the outer or operative portion e' of hardened tool steel I have found that the best results are obtained, and, further, that the rim can be readily hardened without danger of its becoming cracked or warped. It is also important that the pin bearings of the cutters, whether the latter are stationary or revoluble in the disks *a*, shall be in hardened steel, so as not to be subject to wear, it being necessary to maintain the cutters in their normal plane to allow them freedom to draw out of the metal after it has been slit and looped. It has been found, furthermore, that the advantageous results obtained by the use of a composite disk—that is to say, one having its inner portion of wrought-iron or softer metal—and the outer portion of hardened steel cannot be realized by the use of a disk made entirely of hardened steel.

Surrounding the mandrel *b* and placed between each pair of disks *a* is a washer *f*, having an extended superficial area, so that when

✗ (Here follow diagrams marked pp 484 to 485) the series of disks are clamped together upon the mandrel the parallelism of the disks so clamped may be accurately preserved and the cutters relieved from strain, so that should it be considered desirable that they should have rotation upon or around their pins they may be free to rotate.

The roll B comprises a series of disks *g*, Figs. 4 and 6, separated by washer g'. The disks *g* are each provided with a circumferential groove of a shape corresponding to that of the ribber *c*, which works within it. The space between any pair of disks *g* is such as to allow the free entrances of the cutters *d*, the depth of the space determined by the diameter of the washers g' being sufficient to allow the loops formed by the metal cut out by the cutters to have the requisite clearance as the sheet is moved along between the rollers A and B. The disks *g*, like those *a* of the roller A, are formed with their inner portions e^2 of wrought-iron and with steel rims e^3 welded to the wrought-iron central parts, the rims being suitably hardened, so as to reduce their liability to wear. The advantages attending this composite construction are the same as have been alluded to with reference to the co-operating disk of the roll A.

The cutters *d* may or may not be provided with pins, whether the pins are solid with them or not, for as about three-fourths of each cutter is below the peripheries of the disks *a* and the circumferences of the cutters may be brought in contact they may as the disks are firmly clamped together, be held in place without any axial support, it being, as has been previously stated, within the scope of my invention that the rollers need not be made capable of rotation around their axes, but may be stationary so far as such rotation is concerned.

Fig. 10 shows a cutter adapted to have no axial support, its adjustment being seen in Fig. 11.

Heretofore it has been found that the cutters, however constructed in machines of this class, have been liable to become dull or distorted, and a principal object of my invention is to provide a cutter by the use of which such disadvantages may be avoided, and which may be kept in stock and easily replaced when worn or broken, or readily removed for grinding or sharpening. This advantage and that derived from forming the respective disks *a* and *g* in the composite manner described, so that the rims may be hardened without danger of cracking or warping, give greatly increased value to a machine in which the constructions herein described are embodied. Heretofore no machine for this purpose, so far as I am aware, has been provided with cutters and ribbers of such quality as to perform good results, but by my invention these important elements of the machine can readily be given the necessary hardness and temper, the value of which consideration cannot be overestimated.

Having described my invention I claim—

1. In a machine for making metal lath, a roll comprising a series of disks having ribbers upon their peripheries and cutters arranged in spaces between the disks near the circumferences thereof, substantially as set forth.

2. In a machine for making metal lath, a roll comprising a mandrel, a series of disks having ribbers upon their peripheries, circular cutters arranged in spaces between the disks near the circumferences thereof, and washers also in said spaces, substantially as set forth.

3. In a machine for making metal lath, a roll comprising a series of disks having ribbers upon their peripheries and cutters supported on pins in each pair of adjacent disks in the space between them and near the circumferences thereof, substantially as set forth.

4. In a machine for making metal lath, a roll comprising a mandrel, a series of disks having ribbers upon their peripheries, cutters supported on pins in each pair of adjacent disks in the space between them and near the circumferences thereof, and a washer in said space, substantially as set forth.

5. In a machine for making metal lath, a roll comprising a mandrel, a series of disks having grooved peripheries, and a washer in the space between each adjacent pair of disks, said disks being composite, as described—that is to say, the parts immediately surrounding the mandrel being of wrought-iron and the outer parts or rims of steel welded thereto and suitably hardened, substantially as set forth.

6. In a machine for making metal lath, a composite disk the inner part of whose area is of wrought-iron and the outer part of hardened steel, substantially as set forth.

7. In a machine for making metal lath, a pair of rolls each comprising a series of disks clamped on mandrels and constituting together male and female dies, combined with spacing-washers and cutters supported by one roll and adapted to enter the spaces existing between the disks of the other roll, substantially as set forth.

In testimony whereof I have hereto set my hand and seal.

HARLEY ALPHEUS STONE. [L. S.]

Witnesses:
E. J. GRANGER,
W. J. MORGAN.

382

488

(No Model.)

H. A. STONE.

MACHINE FOR PRODUCING METAL LATHING.

No. 459,727. Patented Sept. 15, 1891.

Fig. 1.

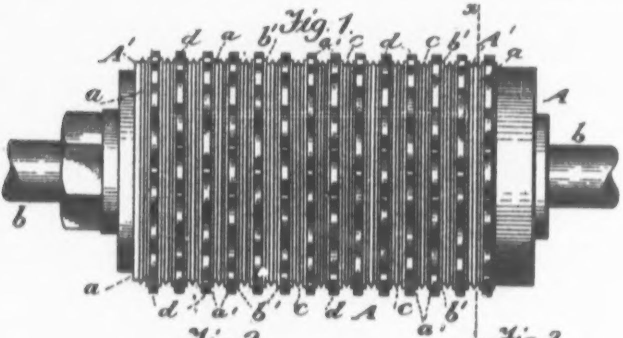
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Fig. 2.

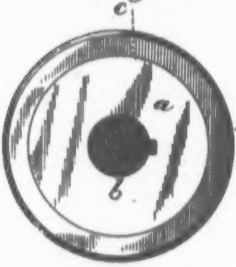
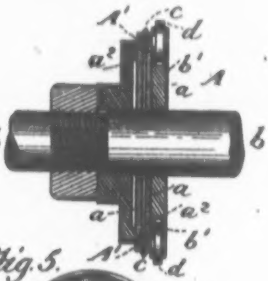


Fig. 3.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b'
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A
b
b
a
a
a²
b'
A'
c
d

Fig. 4.

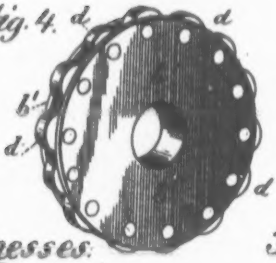


Fig. 5.

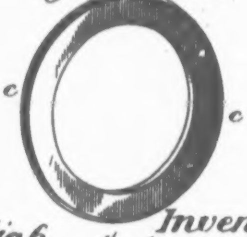
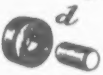


Fig. 6.



Witnesses:
A. Ruppert.
E. Cruise.

Inventor:
Harley Alphens Stone,
by Geo. W. T. Howard
Atty.

No. 606 }
G. F. Co } p 488
Ein. Co }

UNITED STATES PATENT OFFICE.

HARLEY ALPHEUS STONE, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE BOSTWICK METAL LATH COMPANY, OF NEW YORK.

MACHINE FOR PRODUCING METAL LATHING.

SPECIFICATION forming part of Letters Patent No. 459,727, dated September 15, 1891.

Application filed April 28, 1891. Serial No. 390,810. (No model.)

To all whom it may concern:

Be it known that I, HARLEY ALPHEUS STONE, of the city, county, and State of New York, have invented certain new and useful Improvements in Machines for Producing Metal Lathing, of which the following is a specification, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention relates, generally, to that class of machines in which rotary male and female dies are employed, through or between which the sheet metal to be operated upon is passed, and more especially to a machine by means of which in such passage the sheet is slitted and given a series of loops projecting from one side of the sheet and corrugated or ribbed; and it consists in constructions and combinations of parts by means of which the operation of the machine is improved and the structure made more durable and less liable to become unfit to do good work, and whereby, further, certain of its operative parts, when worn, may be readily removed for the substitution of new parts, all as hereinafter specified.

In the accompanying drawings, Figure 1 is a front elevation of one of a pair of rolls constituting my invention. Fig. 2 is a vertical transverse section through the line $x\ x$ of Fig. 1. Figs. 3, 4, 5, and 6 are details, as hereinafter described.

Similar letters of reference indicate similar parts in the respective figures.

The roll containing the male dies is represented by A, the other roll, or that having the female dies, not being shown. The roll A comprises a series of disks A', each consisting of two plates a, of wrought iron, centrally bored to fit the mandrel b, each plate being faced off, as at a^2, to form a recess for the reception of a ribber c, of hardened and tempered steel, which is clamped between the plates. The disks A' are placed so as to leave a space a' between each adjacent pair, this space being occupied by a series of small circular cutters d mounted on detachable pins in a circumferentially-grooved plate b', as shown in Figs. 3 and 4. The cutters d are made of steel properly hardened and tempered, it being of great importance that they shall be durable and capable of maintaining sharpened edges. It is also of great importance that the ribber c shall not be readily subject to wear and shall possess great durability, heretofore much difficulty having been found in constructing a disk the ribber of which has possessed the qualities named. By constructing the disk A' in the manner described—that is to say, of two plates a, with the rubber c of hardened steel clamped between them—I have found that excellent results are obtained, the ribber being readily hardened, which cannot be accomplished when it is integral with the whole body of the disk. The roll with which that A works is preferably constructed in the manner described in my application Serial No. 390,809, to which reference is made.

Heretofore cutters used in machines of this class have been liable to become dull or distorted, and a principal object of my present invention is to provide a cutter by the use of which such disadvantages may be avoided and which may be kept in stock and easily replaced when worn or broken or readily removed for grinding or sharpening. This advantage and that derived from making the disks A' of two sheets of wrought iron and the ribber of hardened steel clamped between them, so that the ribber may be given the proper hardness and temper, give greatly-increased value to a machine in which the constructions here described are embodied.

Having described my invention, I claim—

1. In a roll for machines for making metal lath, a series of disks, each consisting of a pair of metal plates, and a ribber clamped between them, combined with cutters arranged in spaces between the disks near the circumferences thereof, substantially as set forth.

2. In a roll for machines for making metal lath, the combination of a series of disks, each consisting of a pair of plates, and a ribber clamped between them and a series of circumferentially-grooved plates having cutters mounted therein near their circumferences, substantially as set forth.

In testimony whereof I hereto set my hand and seal.

HARLEY ALPHEUS STONE. [L. S.]

Witnesses:
E. J. GRANGER,
W. J. MORGAN.

(Here follows diagram marked C 4 8 F)

386

490

(No Model.)

C. H. CURTIS.
METAL LATHING.

No. 460,850. Patented Oct. 6, 1891.

Fig. 1.

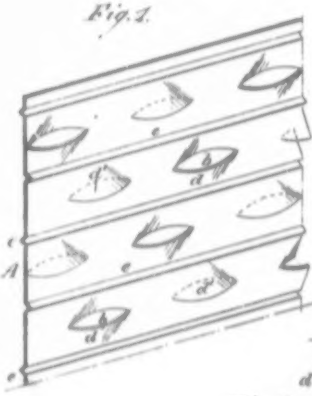


Fig. 2.

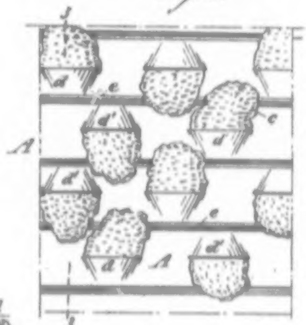


Fig. 3.

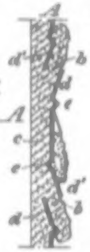

A
d'
b
d
e
c
e
d'
b
d

Fig. 4.

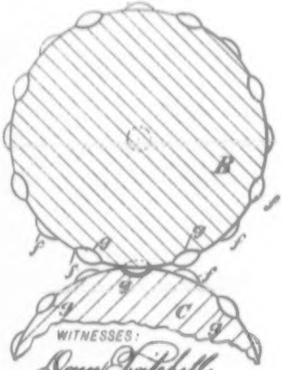
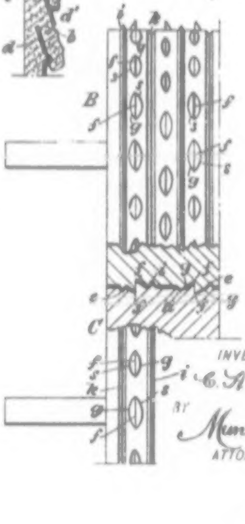


Fig. 5.



WITNESSES:

Donn Twitchell.

C. Sedgwick

INVENTOR

C. H. Curtis

BY

Munn & Co

ATTORNEYS

No. 606.
G. F. Co. } p. 490
E.M. Co

UNITED STATES PATENT OFFICE.

CHARLES HENRY CURTIS, OF NILES, OHIO.

METAL LATHING.

SPECIFICATION forming part of Letters Patent No. 460,880, dated October 6, 189

Application filed March 26, 1891. Serial No. 386,920. (No model.)

To all whom it may concern:

Be it known that I, CHARLES HENRY CURTIS, of Niles, in the county of Trumbull and State of Ohio, have invented a new and useful Improvement in Metal Lathing, of which the following is a full, clear, and exact description.

This invention relates to that description of metal lathing which is constructed of sheet metal having cuts made in it forming openings for entry and clinching of the plaster and in which the cut portions remain attached and are bent to protrude beyond the surface of the sheet, which is made corrugated in addition, to give strength.

The object of my invention is to produce a simple, easily manufactured, and improved fire and vermin proof metal lath of this description, substantially as hereinafter described, and more particularly pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 represents a view in perspective of a piece of sheet-metal lath or lathing constructed in accordance with my invention, said view showing the same before as when in use the plaster is applied to it. Fig. 2 is a rear face view of the same after the plaster has been applied to it. Fig. 3 is a transverse section upon the line 3 3 in Fig. 2. Fig. 4 is a transverse section of a pair of rolls in part with attached knives used in producing the lath, and Fig. 5 is a longitudinal or side elevation of said rolls or devices in part with the adjacent or meeting portions of the rolls in section.

A indicates a piece of my improved sheet-metal lath and which may be of any desired length, width, and thickness. The holes *b* in the plate for reception and clinching of the plaster *c* are made in parallel rows at any suitable distance apart and preferably the one row of holes made intermediate of the next adjacent row of holes. These holes, so far as the cutting of them is concerned, are each made by a single sharp incision without removing metal, yet have a large capacity, not running directly or straight through the sheet or plate, but obliquely therethrough or laterally to the incisions and extending to both or opposite sides of the plate, which is effected by indenting the plate in reverse directions from opposite sides of it, thereby forming reverse curved hoods *d d'* on reverse sides of the plate on opposite sides of each incision. By thus forming the holes or openings through the sheet or plate which constitutes the lath of an enlarged capacity extending obliquely to opposite sides of it a large connecting body of solid plaster to establish the clinch is projected through the lath, as shown in Figs. 2 and 3, which, as it will be seen, is not as liable to loosen as a smaller connecting and clinching body of plaster would be. In addition to this the metal sheet or lath is corrugated to give strength by forming it with ribs *e* of approximately V shape in transverse section between and parallel with the openings *b* and so that each succeeding rib or corrugation is on reverse sides of the sheet or lath. This feature, in connection with the openings made successively or alternately, as described, leaves the lath with no special up or down face or right or left hand side, consequently there need be no delay or trouble in turning a sheet in order to fit one previously put on.

To produce this improved metal lath the sheet of metal forming it is passed between two rolls B C. These rolls are fitted on their peripheral surface with projecting knives, shears, or cutters *f f*, arranged at a suitable distance apart around the rolls and from each other in direction of the length of the rolls to make incisions in the sheet for production of the openings *b* in the latter, arranged as described, and said knives *f f* made with shelving backs *x* and the rolls made with correspondingly-shaped depressions *y* for said backs to work into as the rolls, suitably geared and working in proper housings, rotate in common, in order to form the hoods *d d'* on the sheet, which virtually form the openings *b b* through the sheet. Moreover, as these hoods *d d'* are on reverse sides of the sheet for each opening and on opposite sides of each incision, but respectively on the same side of the sheet for every alternate opening in the same row, the knives, which by their meeting edges and faces as the two rolls rotate in common shear the metal to make the incision, are

(Here follows diagram marked p. 490)

arranged to successively face in opposite directions on each roll, whereby only every alternate hood *d* or *d'* is made to open on the same side of the sheet in the same direction. To produce the V-shaped corrugations or ribs *e* successively on reverse sides of the sheet between the rows of openings *b*, each roll B C is constructed on its periphery alternately with V-shaped annular beads or ribs *i* and annular correspondingly-shaped grooves *k* on opposite sides of or between the annular rows of knives thereon, and so that the annular grooves *i* of either roll come opposite the annular beads *k* of the other roll.

The lath thus made is very rapidly and easily produced, admits of a large number of openings for the plaster being made within a given space with, it may be said, double the body of solid mortar or plaster connecting the outer surface portion of the plaster with the clinching portion, yet with a very small amount of plaster passing through and falling behind the lath, but sufficient to hold the plaster firmly on account of the large solid body connecting through the lath.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. A metal lath consisting of a piece of metal having openings running laterally and obliquely through it formed by longitudinal divisions in the metal and reverse lateral oblique depressions, leaving oppositely-arranged hoods on reverse sides of the body of the lath, whereby provision is made for passage within or through the lath of an enlarged body of mortar or plaster extended to form a clinch, substantially as specified.

2. A sheet-metal lath having a series of openings running laterally and obliquely through it, leaving oppositely-arranged hoods on reverse sides of the sheet, each successive opening in the same line or row having its hood upon either one and the same side of the sheet-face in a reverse direction to that of the hood of the next opening, essentially as described.

3. A sheet-metal lath constructed with a series of openings and parallel V-shaped corrugations having their salient surfaces successively on reverse sides of the sheet, substantially as specified.

CHARLES HENRY CURTIS.

Witnesses:

W. DE P. KNOWLTON,
PAUL H. HUBBARD.

493 No. 606 G. F. Co v. Esee. Co } p. 493

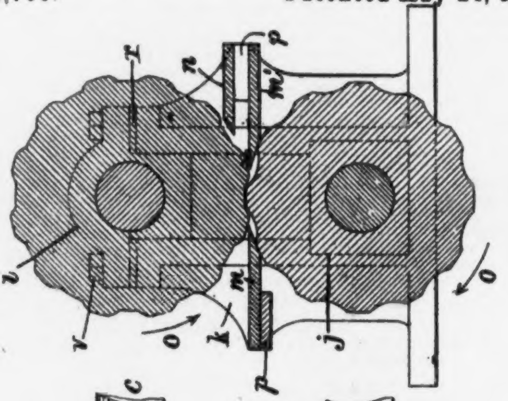
(No Model.) 3 Sheets—Sheet 1.

G. A OHL.

MACHINE FOR MAKING METAL LATHING.

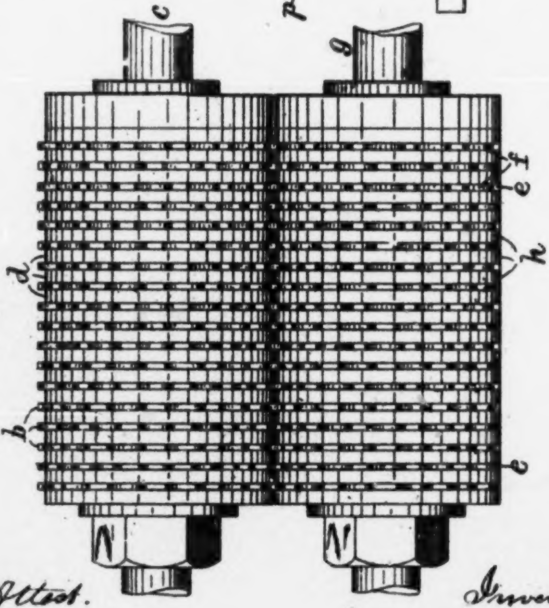
No. 475,700. Patented May 24, 1892.

Fig 2.



x
n
p
m'
i
r
o
k
m
p
j
o

Fig. 1.



Attest.
Chas. R. F.
H. M. Lathe

Inventor
George A. Ohl per
Crane & Miller, Attys.

392

494 No. 606 G. F. Co Cielo } #494

(No Model.) 3 Sheets—Sheet 2.

G. A. OHL.

MACHINE FOR MAKING METAL LATHING.

No. 475,700. Patented May 24, 1892.

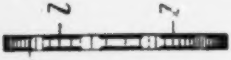


Fig. 9.

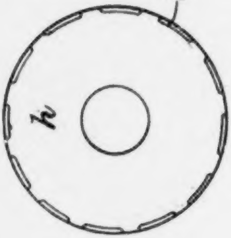


Fig. 8.

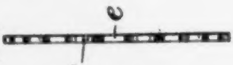


Fig. 7.

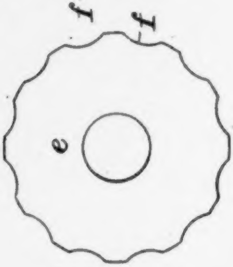


Fig. 6.

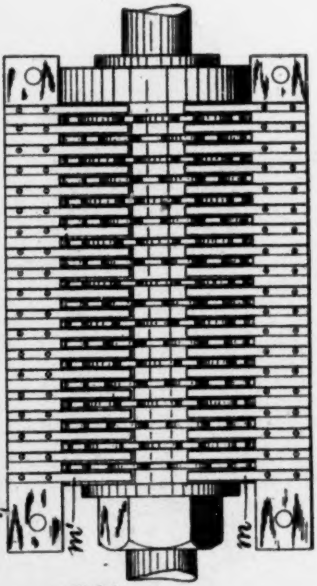


Fig. 3.

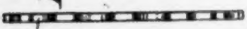


Fig. 5.

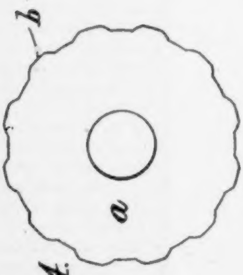


Fig. 4.

Attest:
F. C. Fischer.
J. Van Heest Jr

Inventor
George A. Ohl. per
Crane & Miller, attys

394

495 No. 606 G. F. Co E. tal. } p 495

(No Model.) 3 Sheets—Sheet 3.

G. A. OHL.

MACHINE FOR MAKING METAL LATHING.

No. 475,700. Patented May 24, 1892.

Fig. 10.

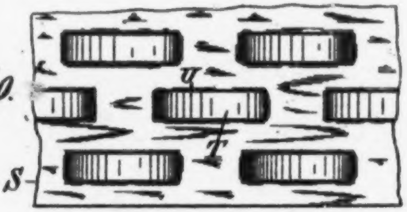


Fig. 12.

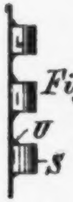


Fig. 11.

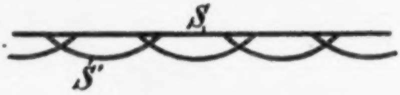
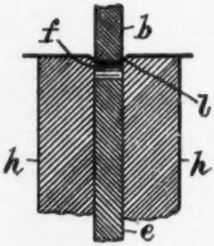


Fig. 13.



Attest:
F. C. Fischer.
J. Alan Neel Jr.

Inventor
George A. Ohl, per
Crane Miller, atty.

UNITED STATES PATENT OFFICE.

GEORGE A. OHL, OF NEWARK, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE BOSTWICK METAL LATH COMPANY, OF NEW YORK.

MACHINE FOR MAKING METAL LATHING.

SPECIFICATION forming part of Letters Patent No. 475,700, dated May 24, 1892.

Application filed April 9, 1890. Serial No. 347,281. (No model.)

To all whom it may concern:

Be it known that I, GEORGE A. OHL, a citizen of the United States, residing at Newark, Essex county, New Jersey, have invented certain new and useful Improvements in Lath-Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The apparatus herein described is adapted to form slots in a sheet of thin metal, with strips attached at both ends to the sheet behind the slot to form a metallic lath to retain plaster upon walls; and the improvement consists in the particular construction of the rolls and strippers hereinafter described.

In the annexed drawings, Figure 1 is a diagram representing the two rolls with portions of their journals. Fig. 2 is a transverse section of such rolls and their strippers, with an elevation of the journal-bearings. Fig. 3 is a plan of the bottom roll with the strippers and stripper-plates. Fig. 4 is a side view, and Fig. 5 an edge view, of one of the punching-disks. Fig. 6 is a side view, and Fig. 7 an edge view, of one of the recessed disks; and Fig. 8 is a side view, and Fig. 9 an edge view, of one of the shearing-disks. Fig. 10 is a plan, and Fig. 11 an edge view of a portion of the sheet-metal lath perforated at two points; and Fig. 12 is an end view of the piece shown in Fig. 10. Fig. 13 is a section of a portion of the disks shown in Figs. 5, 7, and 9, with the piece of sheet metal bent prior to the shearing operation of the punching-disk.

In Fig. 10, S is a portion of the metallic lath, and S′ the strips attached to the sheet at the opposite ends of the apertures T. These strips are formed by sustaining the sheet over suitable recesses and shearing the edges of the strip from the sheet, at the same time stretching the strip longitudinally and bending it into a curve below the aperture, as shown in Fig. 11. The plaster when applied to the flat side of the metallic lath is thus enabled to penetrate through the apertures T and to exude laterally between the strip and the metallic sheet to lock upon the rear side thereof. To hold the plaster more securely in the apertures T, the longitudinal edges U of the aperture through which the strip is sheared require to be bent inward, as shown in Figs. 10 and 12.

My apparatus consists in a series of punching-disks secured together with intermediate collars to form a punching-roll and recessed disks secured together with intermediate shearing-disks to form a die-roll. The punching-disks *a*, as shown in Figs. 4 and 5, each consist of a plate of steel having the same thickness as the width of the apertures T and provided upon its periphery with a series of teeth *b*, adapted each to form one of the apertures. These disks are secured together upon a spindle *c*, Fig. 1, to form a punching-roll, with a series of intermediate collars *d*, above which the teeth *b* project.

The die-roll consists of a series of disks *e* of the same thickness as the disks *a* and notched each upon its periphery with a series of recesses *f*, corresponding with the teeth *b*. These disks are secured together to form a die-roll upon a spindle *g*, with a series of intermediate collars *h* of the same diameter as the recessed disks.

The rolls thus composed are mounted in bearings *i* and *j* in a suitable frame *k* and rotated to force the teeth *b* into the recesses *f*, as shown in Figs. 1 and 2. The teeth *b* operate against the collars *h* to shear the edges of the strips S′ from the sheet and to force the strip downward into the recess, stretching it longitudinally and shaping it, as desired.

The collars *h* are shown formed with a bevel *l* upon their edges adjacent to the disks *e* to bend the edges U at the sides of the apertures T inward toward the strip. Such bevel is preferably formed at intervals corresponding with the recesses *f*, but may be extended all the way around the collars; but it would then have no effect, except where the teeth *b* press the sheet metal into contact therewith. Such bending is effected by the pressure of the teeth *b* before the latter come into shearing contact with the collars *h*, as is clearly shown in Fig. 13, where the tooth *b* is shown pressed upon the sheet metal sufficiently to bend it inward against the bevel *l*. The continued movement of the punch into the recess *f* would obviously shear the lateral edges of the strip and force it into the recess, as desired.

(See [illegible] diagrams marked p. 493, 494 & 495)

As shown in Figs. 1 and 3, the disks *a* and *e* are arranged with the teeth and recesses alternated, so as to form the apertures T in the sheet S in diagonal lines; but the section in Fig. 2 shows only one pair of the opposed disks, with the sections *h* in the lower roll, and does not show the alternate arrangement of the teeth and recesses, as it would greatly confuse the drawing.

To prevent the sheet from clinging to the teeth *b* or to the recesses in the die-roll, a series of narrow strippers are fitted to the collars between the disks *a* or *e*. Two series of strippers *m m'* are provided upon the lower side of the sheet at both sides of the die-roll, and strippers *n* are provided upon the clearance side of the punching-roll, the rolls rotating in the direction indicated by the arrows *o* in Fig. 2. The sheet, which clings strongly to the recesses or to the teeth *b*, is thus prevented from wrapping around either of the rolls.

To facilitate the removal of either series of the strippers, each series is secured upon a bar *p*, which is attached to a lug *q* upon the frame *k*.

I have found that a slight variation in the thickness of the sheet metal required a separate and rigid adjustment of the punching-roll toward the die-roll, and I therefore sustain the bearings *i* of the spindle *c* upon the frame *k* with intermediate packing-plates *r*. The bearing *i* is attached to the frame by bolts *v*, which clamp the same firmly to the frame upon the packing-plates, and thus hold the punching-roll very rigidly when in operation.

It is obvious that the punching-disks *a* are of uniform character and may therefore be made all at once by suitable milling or cutting tools, as well as the recessed disks *e*.

The punching-disks and the collars *h*, against the edges of which the teeth *b* operate to shear the sheet metal, may be separately hardened, and when clamped upon their respective spindles form a roll adapted to rotate truly, which would not be the case if the roll were made of a solid cylinder of steel.

By forming rolls in disk-like sections any of the parts which may be injured can be readily renewed with trifling expense.

The collars *d* intermediate to the toothed disks *a* are used, chiefly, to hold the punching-disks at a suitable distance apart; but they are preferably made of suitable diameter to press the sheet metal between the apertures T against the collars *h*, so as to flatten and smooth the same during the cutting operation.

Having thus set forth the nature of my invention, what I claim herein is—

1. In a lath-machine for punching sheet metal, the combination, with a punching-roll having a series of toothed disks, of a die-roll comprising a series of recessed disks and intermediate shearing-collars, substantially as herein set forth.

2. In a lath-machine for punching sheet metal, the combination, with a punching-roll having a series of toothed disks, of a die-roll comprising a series of recessed disks and intermediate shearing-collars beveled at their edges adjacent to the recesses, as and for the purpose set forth.

3. In a lath-machine for punching sheet metal, the combination, with a die-roll consisting in a series of beveled collars *h* and an intermediate series of recessed sections *e* of the same diameter, of a punching-roll consisting in a series of toothed disks *a*, with intermediate collars *d*, adapted to press the sheet metal upon the collars *h*, as and for the purpose set forth.

4. In a lath-machine for punching sheet metal, the combination, with a punching-roll having a series of toothed disks with intermediate collars and a die-roll having a series of recessed disks with intermediate collars, of a series of strippers applied to the die-roll and a series of strippers applied to the punching-roll, the whole arranged and operated substantially as herein set forth.

5. A lath-machine for punching sheet metal, comprising a punching-roll having a series of toothed disks with intermediate collars, a die-roll having a series of recessed disks with intermediate collars, strippers applied to the die-roll and punching-roll, a suitable frame with bearings for one of the rolls, and bearings for the other roll attached to the frame by bolts, with intermediate packing-plates *r*, the whole arranged and operated substantially as herein set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

GEORGE A. OHL.

Witnesses:
CHARLES W. TEN EYCK,
HENRY J. MILLER.

No. 606
G. F. Co.
v.
Exc. Co. } p. 498

498

(No Model.)

M. H. CRITTENDEN & F. V. EMERY.

METALLIC LATHING.

No. 489,850. Patented Jan. 10, 1893.

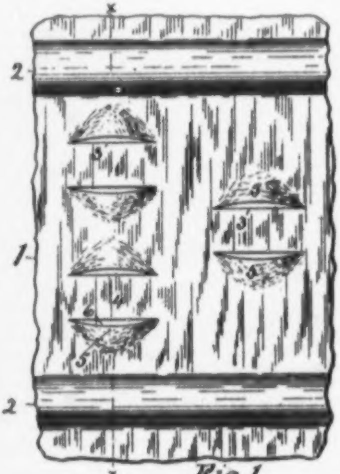

x
2
1
5
3
6
4
5
2
x

Fig. 1

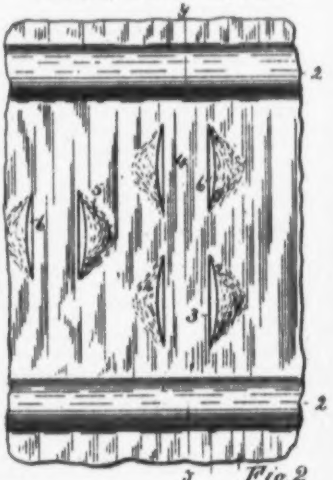


Fig. 2

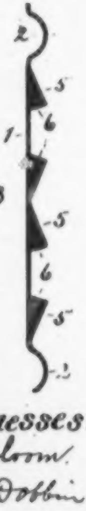


Fig. 3

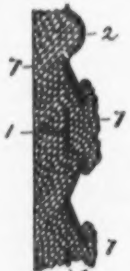


Fig. 5

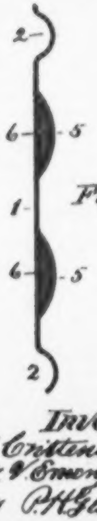


Fig. 4

Witnesses:
R. Bloom.
J. L. Dobbin

Inventors:
Mason H. Crittenden
Frank V. Emery
By their Attorney P. H. Gunckel

UNITED STATES PATENT OFFICE.

MASON H. CRITTENDEN AND FRANK. V. EMERY, OF MINNEAPOLIS, MINNESOTA.

METALLIC LATHING.

SPECIFICATION forming part of Letters Patent No. 489,850, dated January 10, 1893.

Application filed May 24, 1892. Serial No. 434,222. (No model.)

To all whom it may concern:

Be it known that we, MASON H. CRITTENDEN and FRANK. V. EMERY, citizens of the United States, residing at Minneapolis, county of Hennepin and State of Minnesota, have jointly invented certain new and useful Improvements in Metallic Lathing, of which the following is a specification.

Our invention relates to lathing sheets formed from sheet metal for use in plastering walls, ceilings, &c.

The object of the invention is to provide improved devices for holding the mortar by properly slitting and bending portions of the sheet, and thereby also stiffening the lathing sheet as a whole.

Our improvements are illustrated in the accompanying drawings in which—

Figures 1 and 2 are plan views of portions of lathing sheets showing our improvement; Fig. 3, is a sectional view on the line $x—x$ of Fig. 1; Fig. 4, a like view on the line $y—y$ of Fig. 2; and Fig. 5, a view similar to Fig. 3, showing the plastering applied to the lathing.

In the drawings 1 designates a metallic sheet having parallel grooves 2 formed therein at suitable intervals. In the sheet slits 3, in pairs and preferably of equal length, are cut, either parallel with or at angles to the grooves 2. These slits are preferably about an inch in length for ordinary purposes. But their length and their courses relative to the direction of the grooves 2 are matters of choice and not material to the invention. The strips 4 of metal between the pairs of slits are allowed to remain flat, while the metal at the outer sides of the slits is bent outward, preferably to the same height and on the same side of the sheet as the ridges produced in making the grooves 2. Raised lips 5 are thus formed at both sides of the flat strips 4, and their shape is preferably about as shown in the drawings, in which the edge of metal next the slit is bent in curved form and from this edge the indented portion of metal slopes evenly to the flat surface. The displaced metal thus provides an opening 6 between the strip 4 and lip 5 through which mortar may be forced.

In use mortar or plaster 7 is applied to the grooved side of the sheet in the ordinary way and portions of it pass through the openings 6 and around the lips 5, in the manner indicated in Fig. 5, whereby the plastering is firmly locked to the lathing.

The indenting of the body of the sheet to form the lips 5, (instead of bending the strips 4,) stiffens the sheet and produces a better locking device for the plaster than loops formed of the strips 4 would afford.

Having described our invention what we claim is—

1. A metallic lathing sheet having narrow flat strips on a plane with the body of the sheet between parallel slits, and at both sides of such strips raised lips of curved form next the slits and tapering thence to the flat surface of the sheet, substantially as set forth.

2. A metallic lathing consisting of a sheet of metal having at intervals pairs of parallel slits, and having the bodies of metal at the outer sides of the slits bent to form raised lips of curved shape tapering from the edges of the slits to the flat surface of the sheet, substantially as set forth.

3. A metallic lathing sheet having grooves on one side forming corresponding ridges on the opposite side, and intermediate the ridges pairs of narrow flat strips on a plane with the body of the sheet and between parallel slits, and at both sides of such strips raised lips of curved form next the slits and tapering thence to the flat surface of the sheet, substantially as set forth.

MASON H. CRITTENDEN.
FRANK. V. EMERY.

Witnesses:
R. BLOOM,
P. H. GUNCKEL.

(Here follows diagram marked p. 498)

402

No. 606
G. F. Co
500 E. M. Co } $500

(Model.) 2 Sheets—Sheet 1.

G. HAYES.

METALLIC LATHING.

No. 519,952. Patented May 15, 1894.

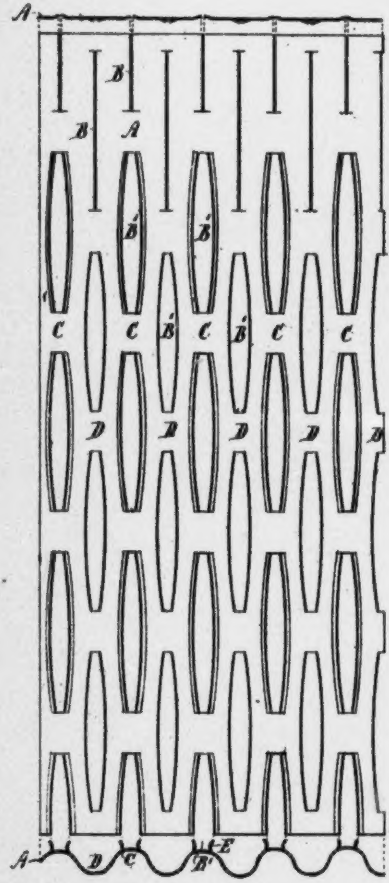

A
B
B
A
B'
B'
C
C
B'
C
B'
C
C
D
D
D
D
D
A
D
C
E
B'

Fig. 1.

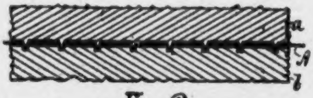


Fig. 2.

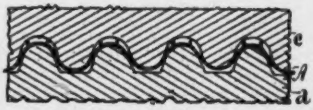


Fig. 3.

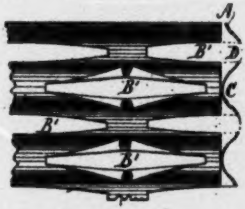


Fig. 4.

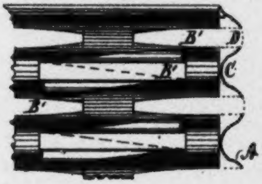


Fig. 5.

Witnesses:
Arthur Hayes.
Wm. J. Graham

Inventor:
Geo. Hayes.

No kob.
G. F. C. } p. 501
[illegible]

501

(Model.) 2 Sheets—Sheet 2.

G. HAYES.
METALLIC LATHING.

No. 519,952. Patented May 15, 1894.

Fig. 6

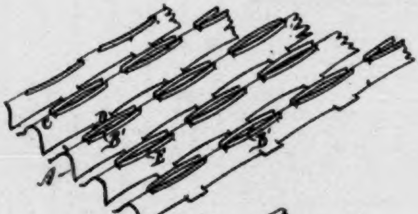
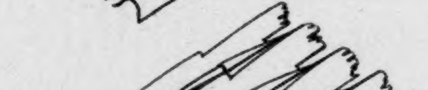


Fig. 7



Witnesses:
Arthur Hayes
Wm. J. Graham

Inventor:
Geo Hayes.

UNITED STATES PATENT OFFICE.

GEORGE HAYES, OF NEW YORK, N. Y.

METALLIC LATHING.

SPECIFICATION forming part of Letters Patent No. 519,952, dated May 15, 1894.

Application filed October 23, 1893. Serial No. 488,892. (Model.)

To all whom it may concern:

Be it known that I, GEORGE HAYES, a citizen of the United States, and a resident of the city, county, and State of New York, have invented a new and useful Metallic Lathing, of which the following is a specification.

My invention relates to those lathings, made from sheets of metal, in which the sheet metal is corrugated to give strength and rigidity to the lathing when in position, and punctured to form bonds for the plastic material intended to be supported by and incorporated with the lathing.

The object of the invention is to so improve the construction of the finished lathing sheets that a greater area of space to be plastered can be covered than heretofore by a like quantity of flat metal sheathing, when converted into lathing; thus reducing the cost of metallic lathing and extending its use and availability in the building arts. In effecting this object, I take advantage of the necessity for apertures of substantial width in the lathing sheet, to serve as bonds for the plaster, by adding the aggregated width of those apertures to the original width of the sheet and thus compensating for the loss in width by corrugation. In brief, my finished lathing sheet is one that has been expanded laterally from the blank sheet of flat metal, and my bonding apertures are formed not by cutting wide pieces out of the sheet, but by slitting the sheet longitudinally, here and there, over its surface, and then stretching the slits apart to make the desired apertures. In doing this, I ascertain by calculation how much of the width of my sheet blank will be lost by the intended corrugation of the sheet—a matter that depends upon the number and height, or depth, of longitudinal corrugations in a sheet blank of given width—and then I determine how many longitudinal slits to form in the sheet, and what their length shall each be, to permit of an expansion sufficient to overcome the loss by corrugation.

In the accompanying drawings, Figure 1 is a face plan of a sheet of my lathing, illustrating stages in the manufacture; having, at the top of the figure, a disconnected section view, additionally illustrating the first stage of puncturing as indicated in the upper part of the main view, and, at the bottom, a disconnected section view, additionally illustrating the advanced stage of puncturing, as indicated in the lower part of the main view. Fig. 2 is a section view, showing the puncturing of the metal sheet by a series of cutting dies. Fig. 3 is a section view, showing the formation of ridges in the metal sheet by means of pressure dies. Figs. 4 and 5 are face plans, showing various modes of treating the apertures made in the sheet, to adapt apertures and their edge metal to the keying and bonding of plaster. Fig. 6 is a perspective of the sheet shown in the first figure when formed into a finished lathing, and Fig. 7, a modification showing another way of treating the edge metal of the apertures.

A is the sheet of metal to be formed into a metallic lathing. B represents slits made in said sheet. B′ represents said slits expanded into wide apertures.

C represents the ridges formed in the sheet.

D represents the depressions produced in the sheet by the process of ridging it.

E represents the lips or tongues that I may choose to form from the edge metal of the expanded apertures.

The letter *a* represents the upper, and *b*, the lower, of the series of cutting dies by which the metal sheet is to be perforated, while *c* represents the upper, and *d*, the lower, of the pressure dies for ridging said sheet, it being preferable that the slitting and ridging of the sheet should be performed by machine action, though they can be performed manually, with tools, when time or expense is not a controlling object.

In carrying out my invention, I take a blank, metal sheet, rectangular in form and of any standard size, and (preferably by means of cutting dies) form therein, at intervals which are regular up and down, as well as across the sheet, long, narrow slits, as shown in the upper part of Fig. 1 of the drawings. The intervals are so laid out on the sheet as that the alternate, longitudinal rows of slits "break joint" with the adjacent rows. Between the proximate terminals of every two slits in a row, a web of metal is left, and this web comes opposite the middle of the adjacent slits on either side of the web. The metal sheet being now slitted on a definite and regular plan, it enters between a pair of rolls or

+ See following diagrams marked pp 500 & 501) dies, as indicated in Fig. 3 of the drawings. The conformation of the faces of this pair of rolls or dies is such that at regular intervals, crosswise of the sheet, they hold the sheet against lateral movement, while pressing out of plane those longitudinal sections of it that are designed to be formed into the ridges C and the depressions D, already mentioned. At the same time, the pressure exerted by these specially conformed rolls or dies opens out the long narrow slits into wide apertures, as appear in the lower part of Fig. 1 of the drawings, and so adapts the slits for the holding of plaster. It will be seen in Fig. 3 that the face of one die does not conform strictly to the face of the other, and this intentional variation gives the needed room and opportunity for the metal sheet to move laterally, as the slits expand, except at those places, or along those longitudinal sections, that are tightly held by the rolls or dies. Usually, the holding points or places would be along the lines of the ridges C; yet, in a variation of the finished surface of the lathing sheet, they might come elsewhere; but they will always be at prescribed and regular intervals over the face of the sheet.

By the described method of design and execution, a sheet metal lathing can be produced; efficient, sightly and regular.

While the foregoing is a sufficient indication and description to sheet metal workers of how to produce the expanded lathing sheet constituting my invention, the production may be effected in other ways, manually and mechanically; it being only necessary to slit the sheet blank in such a manner, longitudinally, as to provide for the desired number and distribution of apertures needed for bonds or keys for plaster, and then to expand the slits into apertures of such width as will not only serve their office, but will compensate for the metal taken out of plane by the ridging of the sheet. And it is obvious that, if desired, the process of expanding the slits may be carried so far that the ridged and finished lathing sheet shall be wider than was the original sheet. The crinkling of the face of the sheet blank will not in the least lessen the lengthwise dimension of the finished lathing for the length of each slit to be subjected to lateral expansion is too insignificant by comparison with the outline of the sheet to have a contracting effect upon the length of the sheet, and there is enough local movement in the web of metal around each slit to accommodate the sheet to the expanding process without drawing it up lengthwise. As to its width, that can be regulated, so as to be of any desired dimension between a measurement much narrower than the original, flat, blank sheet and one materially wider; and whether it be narrower, or wider than, or of the same dimension as the blank sheet, the width will be uniform along the whole sheet of lathing, and the edges straight, while at the same time the original thickness of the sheet metal will be unaffected in dimension and uniformity.

I am aware that ridged and apertured sheet metal lathing, contracted in width by ridging, is common; also, that it is common to expand apertures in sheet metal by stretching; likewise, that it is not new to produce metal sheets with expanded slits and with ridges, transverse to the same; also, that sheet metal lathing has been used, in which are depressions attached to joists or studding, and apertures, on the flat, elevated part of the sheet, widened after such attachment. I claim none of those methods or constructions. I ridge, or ridge and depress, my sheet from its original plane without contraction of its width, when I so desire, and, having regularly slitted my sheet blank, I contrive, by specially formed and adapted pressure dies, in and by a single operation, or by any other suitable and preferred method to produce a ridged and apertured sheet of practicable lathing, with which, when I choose, I can practically and effectually cover a larger area of wall or ceiling space than the sheet blank would have covered in its original state.

I claim as follows:

A corrugated, slitted sheet of metal lathing, in which the corrugations are allowed for by the lateral expansion of the slits; substantially as and for the purposes described.

GEO. HAYES.

Witnesses:
ARTHUR HAYES,
WM. J. GRAHAM.

No. Co.
G. F. Co. } p. 504
Exü. Co.

(No Model.)

J. F. GOLDING.

METHOD OF MAKING EXPANDED SHEET METAL.

No. 527,242. Patented Oct. 9, 1894.

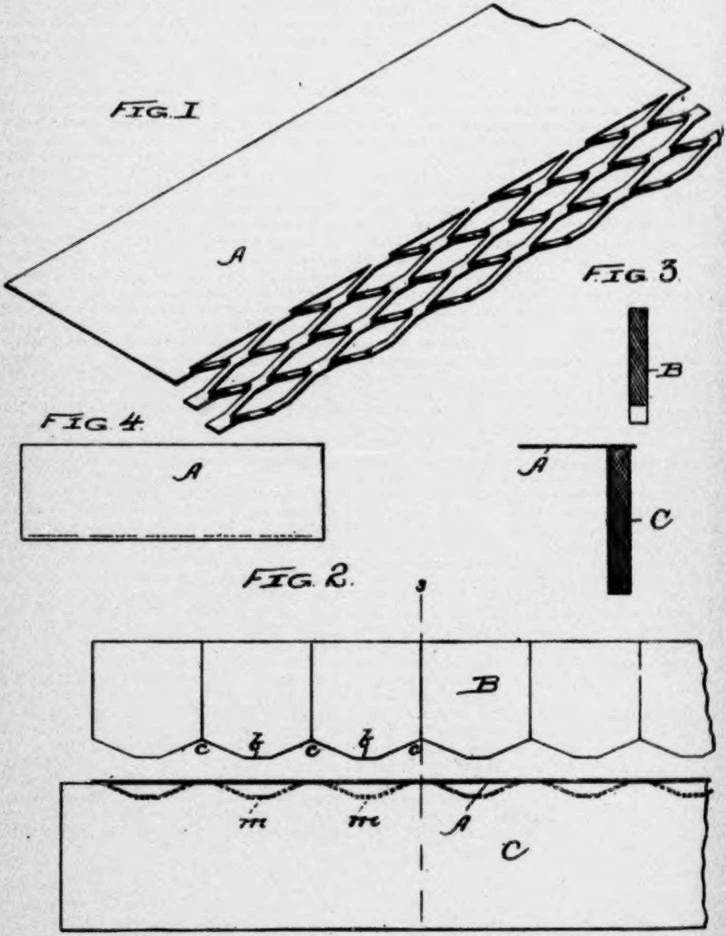


FIG. I
FIG. 2.
FIG. 3.
FIG. 4.

WITNESSES:
Geo. E. Curtis.
H. M. Munday,

INVENTOR:
JOHN F. GOLDING
BY Munday, Evarts & Adcock,
HIS ATTORNEYS.

UNITED STATES PATENT OFFICE.

JOHN F. GOLDING, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE EXPANDED METAL COMPANY, OF MISSOURI.

METHOD OF MAKING EXPANDED SHEET METAL.

SPECIFICATION forming part of Letters Patent No. 527,242, dated October 9, 1894.

Application filed May 7, 1894. Serial No. 510,248. (No specimens.)

To all whom it may concern:

Be it known that I, JOHN F. GOLDING, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in the Art of Expanding Sheet Metal, of which the following is a specification.

In the manufacture of what is now generally known as expanded sheet metal, it has been customary to first cut the slits in the sheet metal at short distances apart, and to open the metal at the cuts thus formed by bending the severed portions or strands in a direction at right angles substantially to the plane of the sheet. It has also been made by simultaneously cutting and opening the metal by means of cutters set off or stepped relatively so as to make the slashes or cuts in different lines in the manner set forth in Patents No. 381,230 or No. 381,231, of April 17, 1888. In both of these methods the product is somewhat shorter and materially wider than the original sheet but practically no stretching or elongation of the metal forming the strands is caused.

In my present invention I seek to avail myself of the ability of the metal to stretch or distend as well as of its ability to bend under strain or pressure, and the invention consists in the improved method of making expanded metal, viz., by simultaneously cutting and opening or expanding the metal at the cuts by stretching the severed portions.

In the practice of the invention I prefer to make a series of slits in a straight line across the edge of the sheet, and at the time of cutting the slits and as a continuation of that operation to depress or stretch the severed metal, *i. e.*, those portions of the sheet lying outside of the cuts, in a direction at right angles to the sheet, without any contraction from the length of the original sheet. This operation is then repeated after the sheet has been fed forward, the slits being made opposite the portions unsevered at the previous operation, and so on until the entire sheet is expanded.

My invention allows the use of a single straight under knife, which of course does not need to be shifted in changing the location of the cuts, and the upper cutters are also arranged in a straight line, but their acting edges represent a corrugated form of alternate transverse projections and recesses adapted to coact with the under knife in cutting the slits at the proper intervals and to stretch the severed strands, and either the upper cutter or the sheet is shifted back and forth between the operations as will be understood.

In the accompanying drawings Figure 1 is a perspective of a sheet, a part of which has been expanded by my invention. Fig. 2 is an elevation of the preferred form of cutters used in manufacturing it. Fig. 3 is a section on line 3—3 of Fig. 2. *Fig.* 4 is a plan of the sheet showing the first line of slits in dotted lines.

In the drawings A represents the sheet from which the expanded metal is formed.

B represents the series of upper or moving cutters and C is the lower knife which may be and preferably is stationary. The lower edges of the cutters B are so shaped as to form alternate transverse projections *b* and recesses or intervening openings *c*, the projecting portions being adapted to coact with the lower knife in forming the slits. They are also adapted to force or carry downward the severed portions of the metal at the same operation to the position indicated by the broken lines *m* at Fig. 2. It will be noticed that at the time the bend is imparted to the severed portion, there can be no contraction in the product from the length of the sheet A because the ends of the severed portion or strand are still integral with the sheet and will not permit it. The sheet is then fed forward and the slitting and stretching operation is repeated. One line of slits across the sheet is formed at each operation, and the upper cutters, or the sheet, may be shifted and the sheet be fed forward between the operations so that the slits are in every case made back of the portions left unsevered at the preceding operation, or in other words the slits and unsevered portions alternate in position at successive operations. The bend given to the severed portion, or strands as they are usually called, is in a direction at

X (Here follows diagram marked p. 504)

right angles to the plane of the sheet, and as there is no contraction in the length of the metal, it necessarily follows that the expansion is obtained from the stretch, distension or elongation of the severed strands.

I claim—

The herein described method of making open or reticulated metal work, which consists in simultaneously slitting and bending portions of a plate or sheet of metal in such manner as to stretch or elongate the bars connecting the slit portions and body of the sheet or plate, and then similarly slitting and bending in places alternate to the first mentioned portions, thus producing the finished expanded sheet metal of the same length as that of the original sheet or plate, substantially as described.

JOHN F. GOLDING.

Witnesses:
L. E. CURTIS,
EDW. S. EVARTS.

412

507 No. 606.
G. F. Co.
v.
Emco } p 507

(No Model.) 7 Sheets—Sheet 1.

J. F. GOLDING.

MACHINE FOR MAKING EXPANDED METAL.

No. 581,713. Patented May 4, 1897.

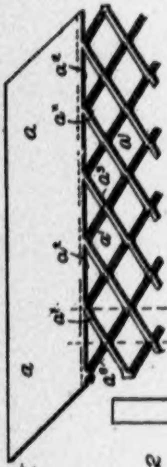

a
a
a'
a²
a³
a⁴
w
x
x

FIG. 1

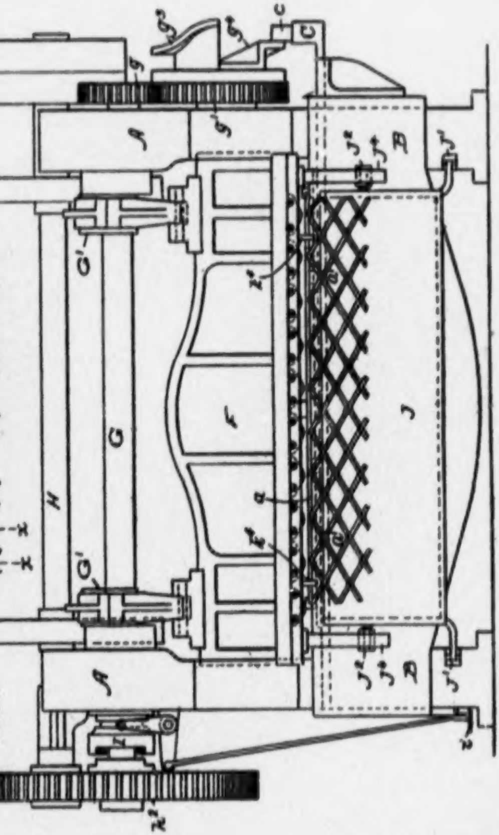

A
A
G
G'
G'
H
F
E'
E²
a
J
B
B
J'
J²
J³
g
g'
g²
g³
C
c
I
K²

FIG. 2

WITNESSES:
Geo. C. Curtis
H. M. Munday

INVENTOR:
JOHN F. GOLDING
By Munday, Evarts & Adcock,
HIS ATTORNEYS.

414

508

No. 606.
Y. F. Co
Exhib } p 508

(No Model.)

7 Sheets—Sheet 3.

J. F. GOLDING.

MACHINE FOR MAKING EXPANDED METAL.

No. 581,713. Patented May 4, 1897.

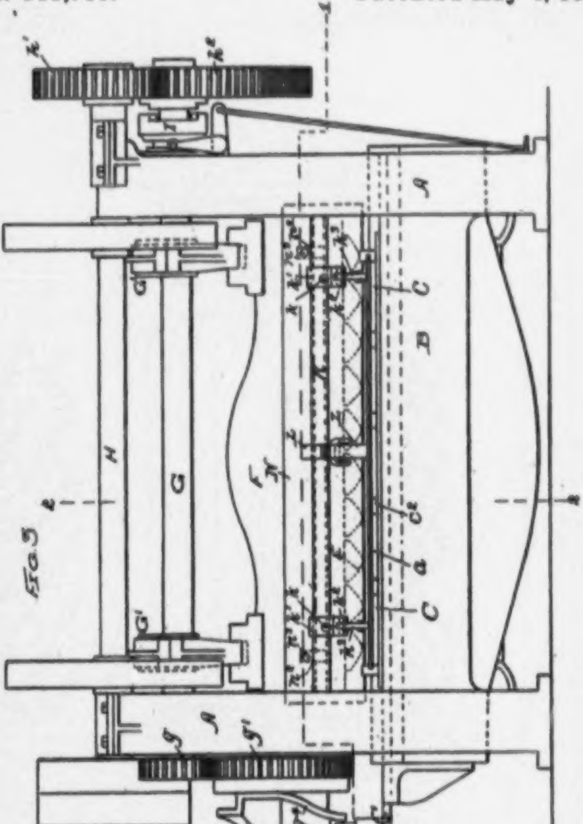


FIG. 3
k'
k²
A
C
D
C²
a
C
G'
G
H
F
K
A
g
g'
1
1
2
2

WITNESSES:
Sam E. Curtis
H. M. Munday

INVENTOR:
JOHN F. GOLDING
BY Munday, Evarts & Adcock
HIS ATTORNEYS

509

No. 606
G. F. Co
〃
E. M. Co. } p 509

(No Model.)

7 Sheets—Sheet 3.

J. F. GOLDING.

MACHINE FOR MAKING EXPANDED METAL.

No. 581,713. Patented May 4, 1897

FIG. 4.

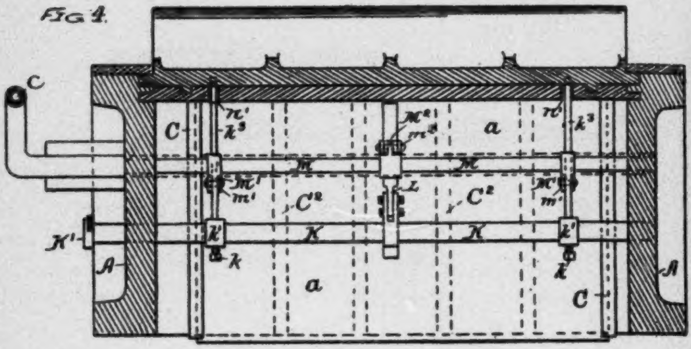

c
C
k³
n¹
M²
m²
a
n¹
k³
M
M
M¹
m¹
C²
L
C²
M¹
m¹
K¹
k
K
K
k¹
k
A
a
k
C
A

FIG. 9.

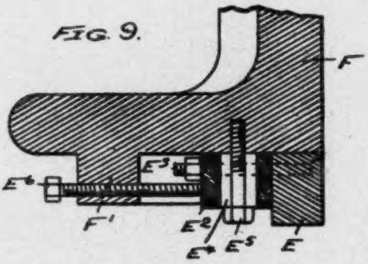
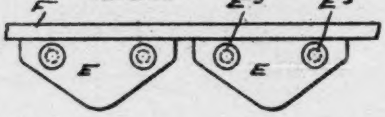

F
E³
E⁶
F¹
E²
E⁴
E⁵
E

FIG. 10



WITNESSES:

Lew. E. Curtis

INVENTOR:

JOHN F. GOLDING

BY Munday, Evarts & Adcock

HIS ATTORNEYS.

418

510 No. 1006 [illegible] } #510

(No Model.)

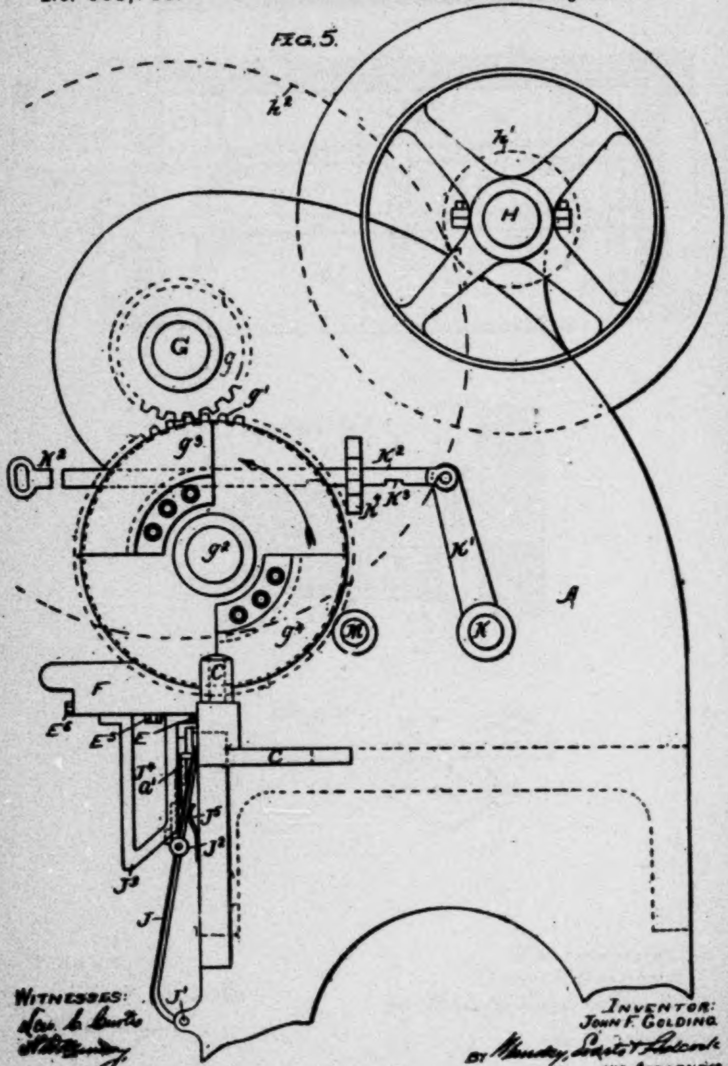
7 Sheets—Sheet 4.

J. F. GOLDING.

MACHINE FOR MAKING EXPANDED METAL.

No. 581,713. Patented May 4, 1897.

FIG. 5.


h²
h'
H
G
g
g'
g³
g²
g⁴
K²
K²
K⁴
K³
K'
K
M
A
C
C
F
E⁶
E⁵
E
J⁴
G'
J⁵
J²
J³
J
J'

WITNESSES:

INVENTOR:
JOHN F. GOLDING
BY Munday, Evarts & Adcock
HIS ATTORNEYS.

No. 606
G. F. Co.
v
Ex. M. Co. } p511

511

(No Model.)

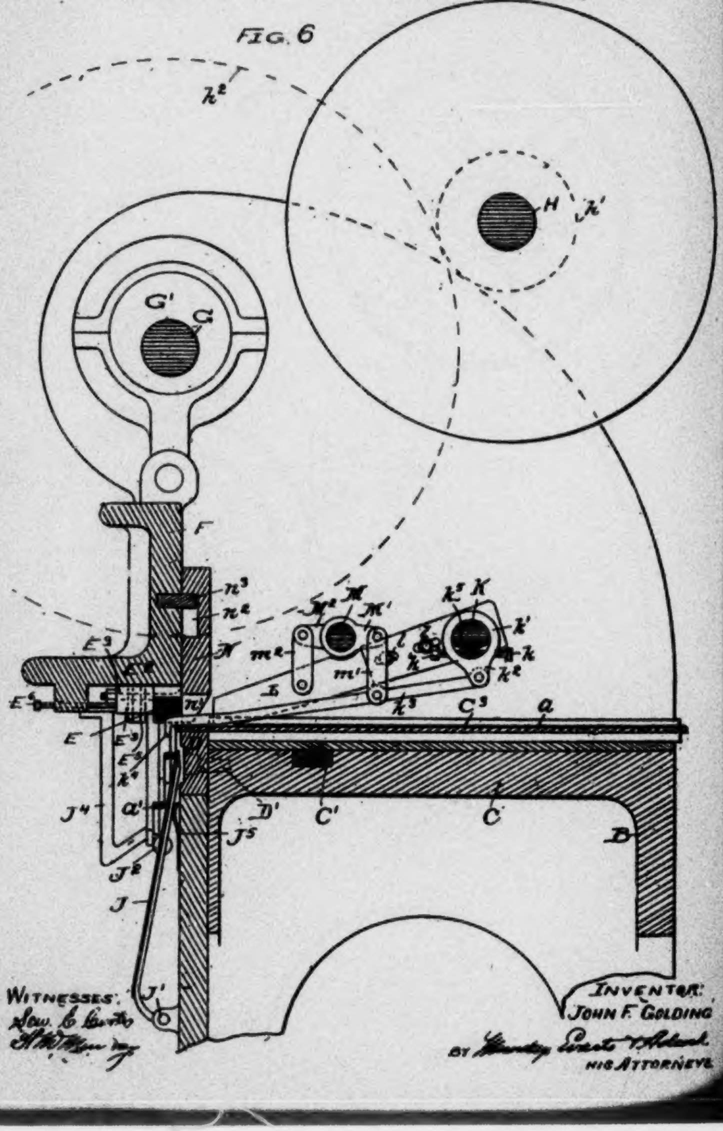
7 Sheets—Sheet 5.

J. F. GOLDING.

MACHINE FOR MAKING EXPANDED METAL.

No. 581,713. Patented May 4, 1897.

FIG. 6


k²
H
k'
G'
G
F
n³
n²
N
E³
E²
E⁶
n'
E
E³
E⁵
k⁴
J⁴
a'
J²
J
J'
m²
M
M'
m²
l
m'
L
k⁵
K
k'
k
k²
k³
C³
a
D'
C'
C
J⁵
B

WITNESSES:
Geo. E. Curtis

INVENTOR:
JOHN F. GOLDING
BY Munday, Evarts & Adcock
HIS ATTORNEYS.

512 No. 606
G. F. Co
Emb } p 512

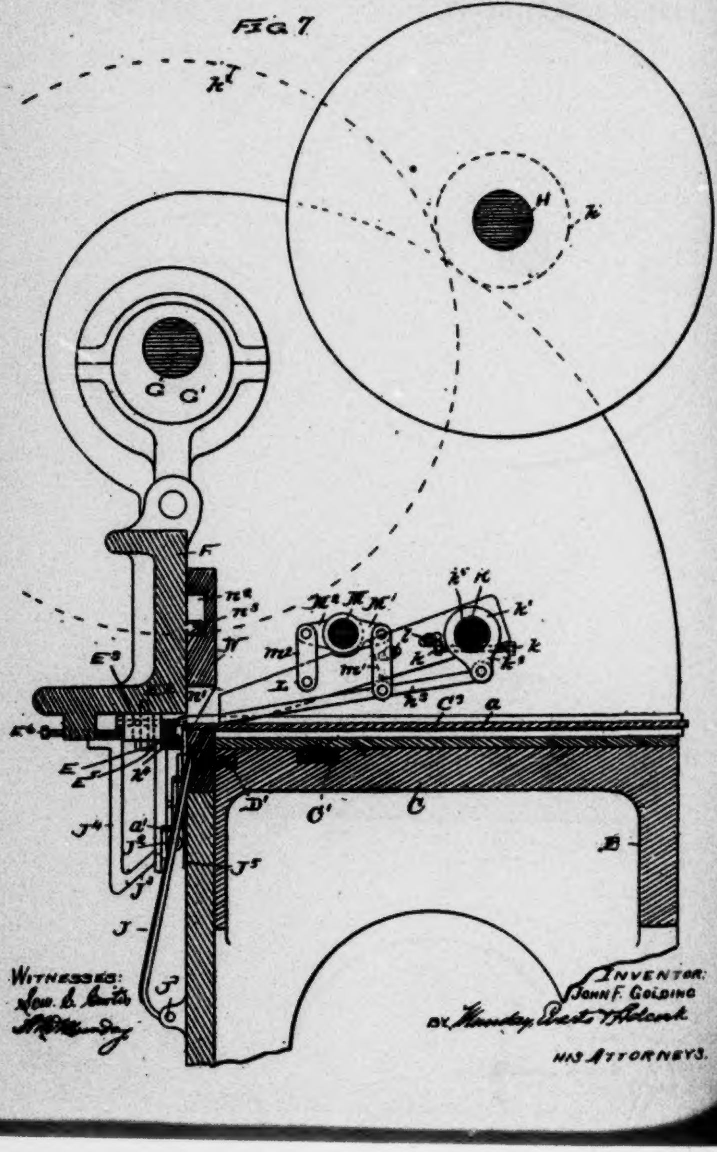
(No Model.) 7 Sheets—Sheet 6.

J. F. GOLDING.

MACHINE FOR MAKING EXPANDED METAL.

No. 581,713. Patented May 4, 1897.

FIG. 7


k^7
H
k
G
G'
F
n^2
n^3
N
E^3
M^2
M
M'
m^2
m'
L
k^6
K
k'
l
k
k^2
k^3
C^3
a
n'
E^6
E
E^5
k^8
D'
C'
C
B
J^4
a'
J^2
J^5
J^3
J
J^7

WITNESSES:
Lew. E. Curtis
H. M. Munday

INVENTOR:
JOHN F. GOLDING
BY Munday, Evarts & Adcock
HIS ATTORNEYS.

513

No. 606
Y. F. Co.
[illegible] } p 513

(No Model.)

7 Sheets—Sheet 7.

J. F. GOLDING.

MACHINE FOR MAKING EXPANDED METAL.

No. 581,713.

Patented May 4, 1897.

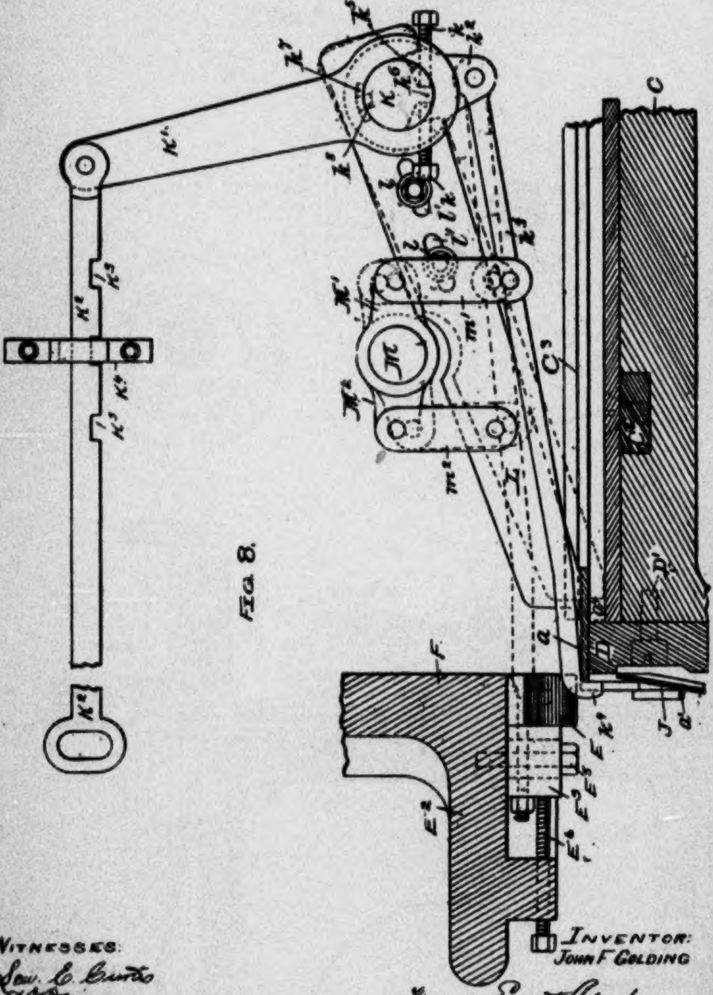

C
K⁸
K⁷
K
K⁶
K¹
K²
K³
K⁴
K⁹
L
M
M¹
M²
m¹
m²
C³
D
D¹
a
a¹
J
F
E
E²
E³
E⁴
E⁵

FIG. 8.

WITNESSES:
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UNITED STATES PATENT OFFICE.

JOHN F. GOLDING, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE EXPANDED METAL COMPANY, OF SAME PLACE.

MACHINE FOR MAKING EXPANDED METAL.

SPECIFICATION forming part of Letters Patent No. 581,718, dated May 4, 1897.

Application filed May 20, 1896. Serial No. 592,284. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. GOLDING, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Machines for Making Expanded Metal, of which the following is a specification.

This invention relates to improvements in machines for the manufacture of open or reticulated metal-work of the kind commonly known as "expanded sheet metal" or metallic trellis-work.

According to my improved machine the meshes of the expanded sheet metal are produced by cutting a series or row of slits and simultaneously with such cutting operation opening the slits mainly by stretching the strips or strands of metal in contiguity to the aforesaid slits, this stretching operation being effected by stretching the strips or strands downward in a direction approximately at right angles to the plane of the sheet.

It is an essential feature in my present machine that the meshes in the sheet metal are produced by stretching instead of by simply bending the aforesaid strips or strands, as heretofore.

In carrying my invention into practice I cut the series of slits in a straight line parallel to the edge of the metal sheet by means of knives, one of which is stationary and has a plain cutting edge, while the other is capable of reciprocating up and down and has a cutting edge of sinuous form. The reciprocating knife may be shifted laterally after each operation and the metal sheet be at the same time fed forward the proper distance to receive a fresh series of slits opposite the portions unsevered at the previous operation, or the said sheet may itself be shifted laterally instead of the knife.

In order that my invention may be clearly understood and readily carried into effect, I will proceed to describe the same more fully with reference to the accompanying drawings. +

Figure 1 is a perspective view of a metal sheet a portion of which has been expanded or formed into trellis-work by my machine. Fig. 2 is a front elevation of the machine. Fig. 3 is a rear elevation thereof. Fig. 4 is a horizontal section of the machine, taken on the line 1 1 of Fig. 3. Fig. 5 is an end view of the machine as seen from the right of Fig. 2. Fig. 6 is a transverse section taken on the line 2 2 of Fig. 3 and as seen from the left; and Fig. 7 is a similar section, but shows the parts in another position. Figs. 8, 9, and 10 illustrate details which will be hereinafter more fully described. Figs. 5 to 10 are drawn on an enlarged scale in order that the parts may be more clearly seen.

Referring first to Fig. 1, a is a metal sheet from which the meshes a' have been produced by the improved machine. a^2 a^2 are the slits or incisions which are cut in a straight line near the front edge of the metal sheet, and a^3 a^3 are the strips or strands of metal as they appear after being stretched by the pressure of the sinuous edge of the upper or reciprocating knife acting thereon during its downward stroke. The act of stretching the series of strips or strands a^3 in this way produces a row of triangular meshes or semimeshes adjacent to the edge of the metal sheet. After the formation of these semimeshes the metal sheet is shifted laterally for a distance equal to the space between the vertical lines x x, that is to say, a distance equal to half a mesh. The metal sheet is then also fed forward a distance equal to the width of the strips or strands a^3. The reciprocating knife then again descends and produces a second row of semimeshes immediately above the row produced at the previous operation. A row of complete meshes of lozenge shape is thus formed. The metal sheet is then again shifted laterally, but in the opposite direction to its former lateral movement, and is also again fed forward. The metal sheet is then ready to be once more acted upon by the knives in forming another row of semimeshes above the previous row in the manner already stated.

Referring now to Figs. 2 to 10, A A are end standards rigidly connected together near their lower ends by a strong frame B, the upper portion of which serves as a support to receive a laterally-reciprocating table C for the metal sheet or blank a. D is the plain-edged knife, which is secured to the front edge of the table C by screws D′. E is the sinuous-edged knife, which is composed of a

+ (Here follow diagrams marked pp. 507 to 513) number of separate cutters having spaces between them. These cutters are carried by a reciprocating head F, which receives a rectilinear up-and-down movement from eccentrics G' G', mounted on a shaft G, that is driven from a counter-shaft H by means of suitable toothed wheels h' h^2. I is a clutch which can be operated from a treadle i for throwing the said shaft G into or out of gear with the aforesaid toothed wheels h' h^2. g is a toothed pinion which is keyed to one end of the shaft G and gears with a toothed wheel g', mounted on a stud g^2, projecting from the outer face of the end frame of the machine. This wheel g' is provided with two cam-pieces g^3 g^4, which are so shaped that when the machine is working they give a lateral movement to the before-mentioned table C first in one direction and then in the other, with a pause between each movement, by acting on a roller c, carried by a pin projected upwardly from one end of the table. On the under side of the said table is a fillet c', which works in a groove in the frame B and guides the table during its movements. The surface of the table is provided with a series of transverse bars c^2, upon which the under side of the metal sheet a rests, and the two outermost of these bars are formed with grooves c^3, into which the end edges of the sheet enter and by which the said sheet is guided as it is fed from rear to front of the machine.

The feeding of the sheet is effected by a frame or flap J, which is pivotally connected at J' to the end standards A of the machine and is provided with a roller J^2 at each end. These rollers are so situated that they can be acted upon by inclines J^3, formed on brackets J^4, bolted to the under side of the head F. As this head descends to bring its knives E onto the metal sheet the aforesaid inclines J^3 come against the rollers J^2 and by acting thereon cause the frame J to turn inwardly about its pivots and its upper edge to enter recesses formed therefor in the stationary knife D. (See Fig. 8.) J^5 are springs which act to return the frame to its outward position when the head F and its inclines J^3 rise. The said frame thus receives an oscillatory movement during the rise and fall of the head F, and each time it performs a forward stroke it presses against the meshes a' of the expanded sheet metal in front of it, and thereby causes the sheet to advance a certain distance, ready to be acted upon at the next downstroke of the upper knives E. In order to limit the extent of this forward stroke of the said frame, and thereby regulate the feeding of the metal sheet through the machine, I provide a rocking shaft K, which is furnished at one end with a lever K', whose outer end is pivotally connected to a movable bar K^2, having a series of notches K^3 in its lower edge, Fig. 8. This notched bar K^2 is situated within easy reach of the machine attendant, so that he can shift the said bar in either direction and retain it in such shifted position by bringing one or other of its notches into engagement with the bracket K^4, in which the said bar slides. Secured to the aforesaid rocking shaft K by set-screws k are sleeves k', having lugs k^2, to which are pivotally connected arms k^3, having bent outer ends or fingers k^4, which normally lie in a stationary position in advance of the front edge of the metal sheet a. These fingers serve to limit the extent to which the said sheet can move forward when acted upon by the before-mentioned frame J. By shifting the notched bar K^2 the rocking shaft K and therefore the arms k^3 can likewise be shifted to bring the aforesaid fingers k^4 nearer to or farther from the edge of the metal sheet under operation. For the purpose of effecting a fine adjustment of the position of the said fingers relatively to the front edge of the metal sheet the rocking shaft K is formed with inclined recesses k^5, into which the inner ends of the set-screws k enter and bear upon the metal portion k^6, existing between the bottoms of these recesses. (See Fig. 8.) The said sleeves are also formed with segmental slots k^7 for the reception of feathers k^8 on the rocking shaft. By turning the set-screws in one or other direction the position of the aforesaid fingers k^4 on the arms k^3 can be adjusted independently of the rocking shaft K.

The means hereinbefore described for controlling the feed of the metal sheet also enable any required width of the expanded metal to be severed from the said sheet. This is effected by merely drawing the notched bar K^2 outward a sufficient distance to cause the fingers k^4 to move inwardly and restore the metal sheet to the position it occupied prior to its preceding feeding movement. This retraction of the metal sheet does not, however, interfere with its lateral movement. Consequently when the upper knives E next descend they act upon the metal existing between and in alinement with the previous line of incisions, thereby completely severing the expanded metal from the sheet a. The notched bar K^2 is then returned to its original position, and the machine will continue working as before.

Mounted loosely on the before-mentioned rocking shaft K, so as not to turn therewith, is an arm L, which is situated approximately midway between the sleeves k'. The free end of this arm rests by its own weight upon the metal sheet that is being operated upon in the machine. Situated above the said arm L is a rocking shaft M, having thereon levers or lugs M' and M^2, which project in opposite directions. The lugs M' are pivotally connected by links m' to the aforesaid arms k^3, and the lug M^2 is pivotally connected to the arm L by links m^2. (See Figs. 4 and 8.) So long as the free end of the arm L rests upon the metal sheet passing through the machine, the parts just above mentioned remain in the position represented by the full lines in Fig. 8; but when the rear edge of the metal sheet has advanced far enough forward to escape from beneath the free end of the arm L the latter is no longer supported by the metal sheet and therefore falls by the action of gravity into the position indicated by the dotted lines in Fig. 8. Simultaneously with the fall of the arm L the arms k^3 are raised by the partial rotation of the shaft M and the resulting movement of lugs M' M^2 in opposite directions. The fingers k^4 on the arms k^3 are thus raised out of the path of the metal sheet and no longer act to retard its forward movement. The metal sheet is therefore liberated and is free to be ejected from the machine when the frame J next performs its forward stroke. The arm L is preferably made in two pieces, which are connected together by bolts l, passing through slots l', so that the length of the arm can be varied. In this manner I can readily regulate the periods at which the expanded sheet is ejected from the machine, and consequently the width of the plain marginal portion a^4, Fig. 8, with which the expanded sheet metal is sometimes provided.

For the purpose of firmly holding the metal sheet while the knives are acting thereon I employ a presser-bar N, Figs. 6 and 7, which is situated at the back of the head F and works in guideways formed in the end standards A of the machine. This presser-bar is formed with apertures n' in its lower edge to permit of free upward movement of the fingers k^4 when the arms k^3 are raised or shifted, as hereinbefore stated. The said presser-bar is also formed with vertical slots n^2 at intervals for the reception of lugs or projections n^3, standing out from the back of the head F. These slots and lugs are so situated relatively to each other that as the head F ascends and just before completing its upward movement the lugs come against the upper ends of the slots, and thereby lift the said presser-bar N out of contact with the metal sheet, so as not to impede the forward and lateral movements of the latter at the required times. When the head F again descends, the presser-bar comes into contact with the metal sheet before the knives E reach it, and therefore the said presser-bar holds it firmly against the lower knife D ready to receive the cutting and stretching operation. The presser-bar remains in this position until again lifted by the lugs n^3 after they reach the upper ends of the slots n^2 at the next ascent of the head F. A comparatively long pause in the movement of the presser-bar thus takes place, so that the metal sheet is firmly held during the whole time that it is being acted upon by the knives and until the cutting edges of the upper knives have ascended beyond the upper surface of the metal sheet.

To enable the upper knives E to be readily adjusted in the head F and to permit of their being conveniently detached therefrom and replaced by others, I connect them to the head F in the manner shown at Figs. 9 and 10. Each of the knives E is bolted to a block E^2 by means of two bolts E^3, and the said blocks E^2 are formed with slots E^4, through which vertical screws E^5 pass for retaining the said blocks to the head F. These slots enable the knives to be shifted in a horizontal direction toward or away from the lower knife D. The under side of the head F has a flange F', carrying horizontal adjusting-screws E^6, whose inner ends bear upon the aforesaid blocks E^2. By loosening the screws E^5 and turning the screws E^6 the cutting edges of the knives E can be caused to approach nearer to or recede farther from the edge of the stationary knife D. Moreover, the aforesaid knives E can, if desired, be readily detached from the head F and be replaced by others of a different size for producing meshes of larger or smaller dimensions.

One or other of the hereinbefore-mentioned grooves c^2 in the outermost bars c^3 of the table C may be provided with a spring which is adapted to bear with some force against one edge of the metal sheet and hold it tightly in position when the said sheet is inserted into the grooves. By this means I am able to conveniently compensate for sheets of slightly-varying dimensions, whereas without the above compensating device it would be necessary to trim the edges of the sheets or otherwise treat them in order that the sheets should rest properly on the table C; otherwise unsatisfactory results would be obtained when producing expanded metal having small meshes.

The working of the machine is as follows: The metal sheet a is adjusted in the machine by the attendant, who for this purpose stands at the back of the machine and places the end edges of the sheet in the grooves c^2 in the table C. He then pushes forward the sheet as far as it will go, that is to say, until its front edge comes against the fingers k^4, these fingers having assumed their lowered position during the advance of the sheet owing to its front edge coming against and raising the arm L. At this time the head F and its knives E are in their fully-raised position, as also is the presser-bar N, and the frame J is in its forward position. The machine is now set in motion by actuating the treadle i. The head F and presser-bar N then descend together until the said presser-bar, which projects somewhat beyond the knives, bears upon the metal sheet a. The presser-bar now remains stationary while the head F continues to descend, the lugs n^3 and slots n^2 permitting of this movement. As the head F descends its inclines J^2 act upon the rollers J^3 of the frame J, thereby causing the latter to move inwardly, Fig. 7, and the upper end of the apron to be housed in the recesses in the lower knife D. The knives then simultaneously form the series of slits or incisions in the sheet a and stretch the strands of metal a^3, Fig. 1, as already described, the lowest part of the stretched strands now lying in front of the frame J. The head F next commences to rise, and as soon as it ascends high enough to bring its lugs n^3 against the upper ends of the slots n^2 it also lifts the presser-bar N. The inclines J^8 are also at this time removed from the rollers J^9, and were it not for the fact that the fingers k^4 are still in front of the metal a^X, Fig. 1, connecting the meshes a' a' to the sheet a, the latter would be fed forward by the outward stroke of the frame J acting under the influence of its springs J^6. It is now, however, that the cam-piece g^1 on the wheel g' arrives in contiguity to the roller c on the table C, and by acting upon the said roller shifts the table laterally for such a distance that the new slits which will be made at the next descent of the knives E will be formed opposite the portions of metal a^X that were unsevered at the previous operation. The table C in performing its lateral movement and shifting the metal sheet in the above manner removes the portion of metal a^X connecting the meshes to the sheet, so that the fingers k^4 lie opposite the space in the meshes. These fingers, therefore, now no longer offer any impediment to the feeding forward of the metal sheet, and consequently the frame J rocks forward about its pivots under the action of its springs and feeds the metal sheet forward against the fingers k^4. The extent of this movement is equal to the width of the strand that has been previously cut and stretched. The head F and its knives E, together with the presser-bar N, then again descend and the metal is once more slit and stretched in the manner already described. After this the head F reascends and the table C is shifted laterally in the opposite direction to its former movement by the cam-piece g^4 acting on the opposite side of the roller c. The sheet is then again fed forward by the frame J, as already explained, and is ready for a fresh slitting and stretching operation to be performed. These operations continue until the rear edge of the sheet or blank passes beyond the free end of the arm L. This arm then descends and raises the fingers k^4, as hereinbefore described, so that the complete expanded sheet is delivered from the machine by the increased forward stroke of the frame J as the latter is turned outwardly by its springs. A fresh sheet is then inserted in place on the table C and the machine performs a similar cycle of operations as before.

What I claim is—

1. In a machine for forming expanded sheet metal, the combination with a laterally-shifting support for the sheet, an upper vertically-moving cutter and a lower stationary cutter, said cutters being adapted to slit and simultaneously stretch the metal, of devices for feeding the sheet acting upon the expanded portion thereof, substantially as specified.

2. In a machine for forming expanded sheet metal, the combination with cutters acting to slit and simultaneously stretch the metal as set forth, of devices for feeding the sheet and adapted to act upon the expanded portion thereof, devices for engaging the sheet and serving to regulate the feed, and means for shifting the sheet, substantially as specified.

3. In a machine for producing expanded sheet metal, a feeding device consisting of a hinged or pivoted spring-controlled frame and inclines carried by the reciprocating head of the machine, the said inclines acting upon the hinged or pivoted frame substantially as described and for the purpose specified.

4. In a machine for producing expanded sheet metal, a device for regulating the feed and for enabling any desired width of the expanded metal to be severed from the metal sheet, the said device consisting of arms having fingers at their outer ends and pivotally connected at their inner ends to a shaft which can be rocked in one or other direction and be retained in such position substantially as described.

5. The combination with the herein-described feed-regulating device of means for regulating the position of the fingers, the said means consisting of set-screws k passing through sleeves k' carrying the pivoted levers k^2 and acting on opposite sides of the shaft K, feathers k^6 on the said shaft, and segmental slots k^7 into which the said feathers enter, so that by turning the set-screws the sleeves can be shifted angularly in either direction on the shaft substantially as described.

6. In a machine for producing expanded sheet metal means for enabling the expanded sheet to be automatically delivered from the machine, the said means consisting of an arm loosely mounted on the shaft K with its free end normally resting on the sheet of metal passing through the machine, the pivoted arms k^3, and lever mechanism connecting the said arm to the pivoted arms k^3, substantially as described.

7. In a machine for producing expanded sheet metal, the combination with means for cutting and expanding the metal and means for feeding the sheet, of automatic means for determining when the sheet shall be ejected from the machine, substantially as specified.

8. The machine for forming expanded open-work metal sheets, wherein are combined a laterally-shifting support for the sheets adapted to shift between the cutting operations, devices adapted to engage the expanded portion of the sheets and feed them forward, a stationary straight-edged cutter, and a sinuous-edged cutter moving in a fixed vertical plane and coacting with the straight-edged cutter in severing the sheet and acting also to stretch the severed portions in a direction approximately at right angles to the plane of the sheet, substantially as specified.

9. In a machine for producing expanded sheet metal, the combination with means for cutting and expanding the metal and means for feeding the sheet, of an arm L resting at

its free end upon the sheet and serving to determine when the sheet shall be ejected from the machine, substantially as specified.

10. In a machine for producing expanded sheet metal, the combination with means for cutting and expanding the metal and means for feeding the sheet, of an arm L resting at its free end upon the sheet and adjustable as to length and serving to determine when the sheet shall be ejected from the machine, substantially as specified.

11. The combination, in a machine for producing expanded sheet metal, with the cutters, the feed mechanism and the feed-regulating devices, of means for throwing said regulating devices out of action and allowing the sheet to be ejected by the feed mechanism, substantially as specified.

12. The combination, in a machine for producing expanded sheet metal, with the cutters, the feed mechanism and the feed-regulating devices, of adjustable means for throwing said regulating devices out of action and allowing the sheet to be ejected by the feed mechanism, substantially as specified.

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Witnesses:
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519 No. 606 [illegible] } p. 519

No. 664,379. Patented Dec. 25, 1900.

E. S. BRADFORD.

MACHINE FOR MAKING EXPANDED METAL.

(Application filed Sept. [illegible])

(No Model.) 6 Sheets—Sheet 1.

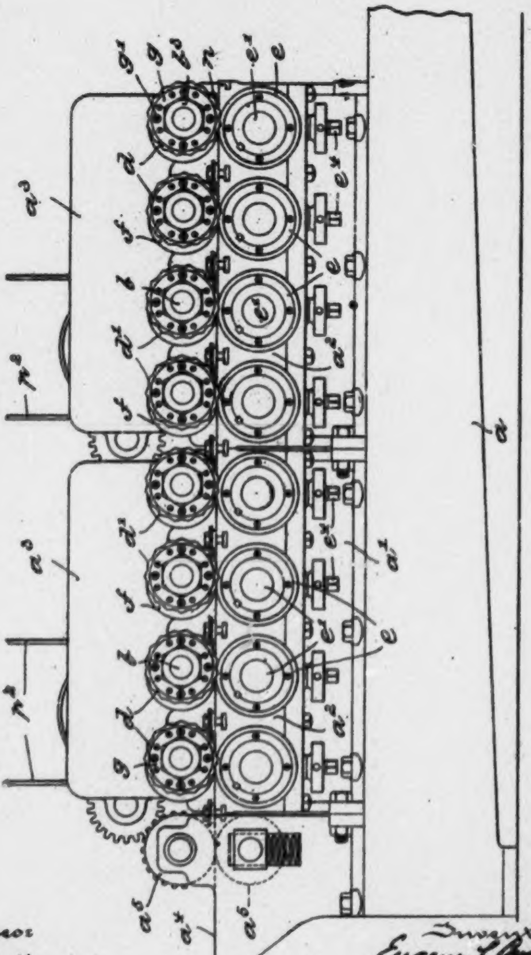

Fig. 1.
a
a1
a2
a3
a4
a5
a6
b
d
d1
e
e1
e4
f
f1
g
g1
h
h2

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G. F. Co
v.
E. M. Co. } p 520

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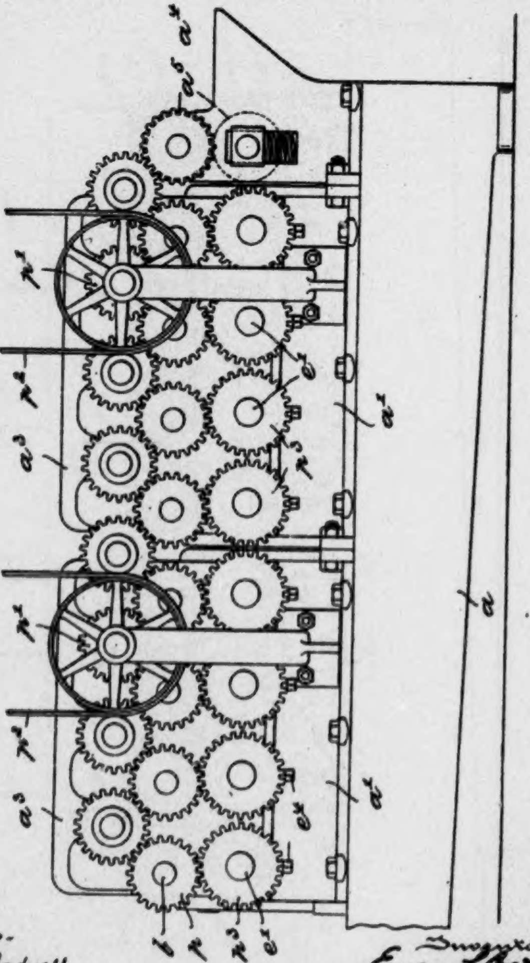
E. S. BRADFORD.

MACHINE FOR MAKING EXPANDED METAL.

(Application filed Sept. 5, 1899.)

(No Model.) 6 Sheets—Sheet 2.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a^5
p^1
p^2
a^3
e^1
p^3
a^2
p^1
p^2
a^3
e^4
a^2
a
b
p
p^3
e^1

Fig: 2.

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No. 606
G. F. Co
Exhib. } p. 521

No. 664,379. Patented Dec. 25, 1900.

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MACHINE FOR MAKING EXPANDED METAL.

(Application filed Sept. 5, 1899.)

(No Model.) 6 Sheets—Sheet 3.

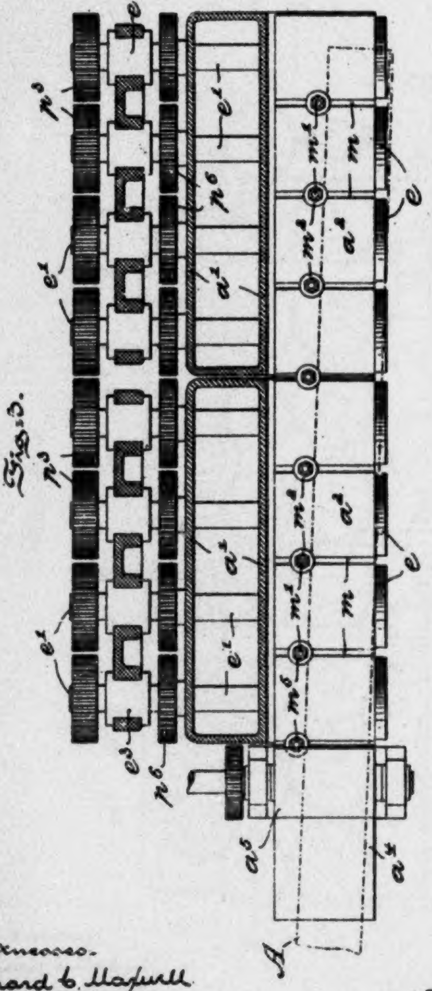
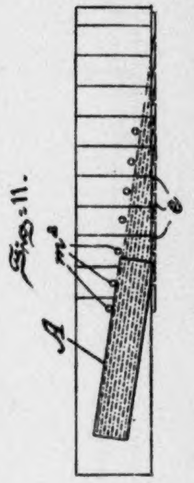


Fig. 3.
p3
e3
e1
p6
a1
m1
m
m2
a2
e
m5
a5
a4
A



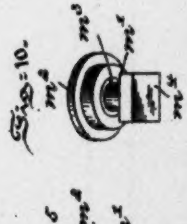


Fig. 10.
m2
m3
m1
m4

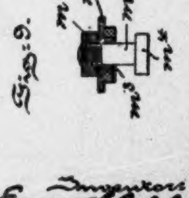


Fig. 9.
m5
m4
m1
m4
m3

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No. bob.
G.F. Co
B.W.Ba } p. 522

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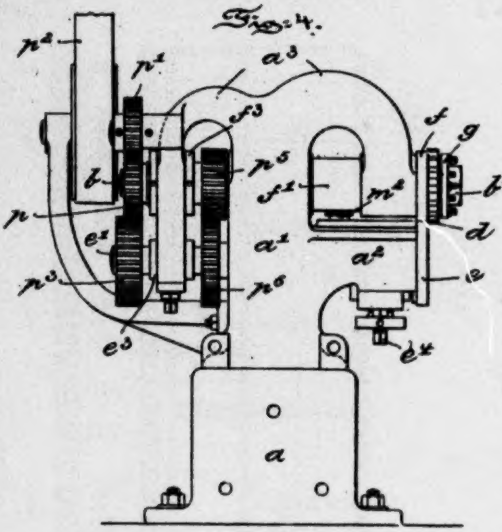
E. S. BRADFORD.

MACHINE FOR MAKING EXPANDED METAL.

(Application filed Sept. 8, 1900.)

(No Model.) 8 Sheets—Sheet 4.

Fig. 4.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f^3
f
g
p^5
b
f^2
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b^3
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d
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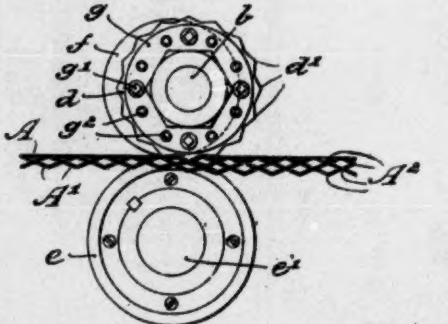
a^1
a^2
e
p^3
p^6
e^3
e^4
a

Fig. 12.


g
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d^1
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d
g^2
A
A^2
A^1
e
e^1

Witnesses:
Richard C. Maxwell
Thomas M. Smith.

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G. F. Co
[illegible] } p: 523

No. 664,379. Patented Dec. 25, 1900.

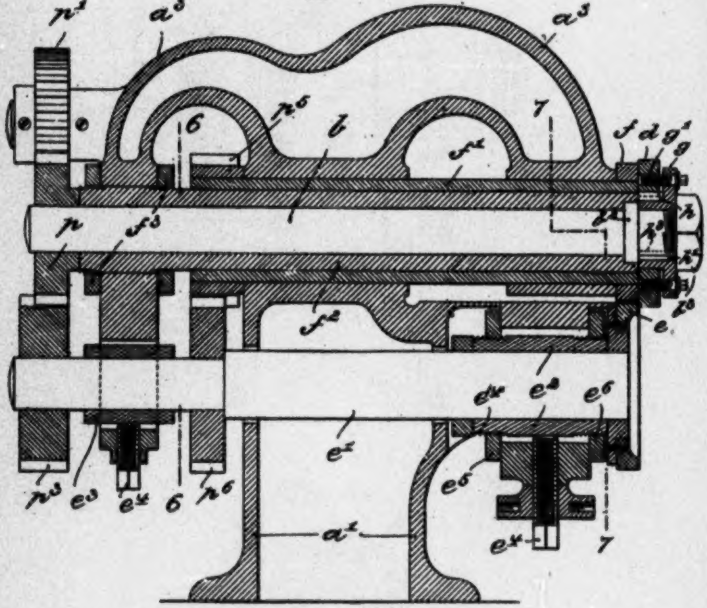
E. S. BRADFORD.

MACHINE FOR MAKING EXPANDED METAL.

(Application filed Sept. 5, 1899.)

(No Model.) 8 Sheets—Sheet 5.

Fig: 5.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n5
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b
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f4
f
d
g1
g
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f3
n2
f2
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e3
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e5
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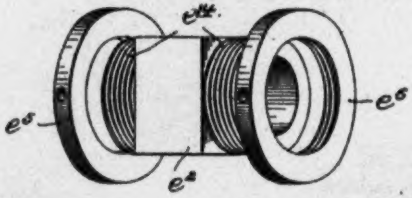
e3
e4
6
n6
a1
e4
7

Fig: 13.



Witnesses:
Richard C. Maxwell
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Inventor:
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Clarke } p. 524

No. 664,379. Patented Dec. 25, 1900.

E. S. BRADFORD.

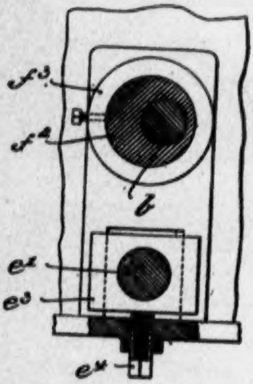
MACHINE FOR MAKING EXPANDED METAL.

(Application filed Sept. [illegible], 1900.)

(No Model.)

6 Sheets—Sheet 6.

Fig: 6.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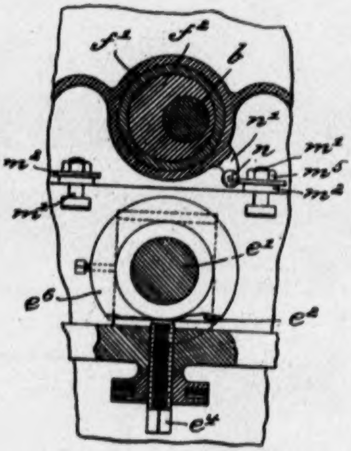
b
e1
e3
e4

Fig: 7.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b
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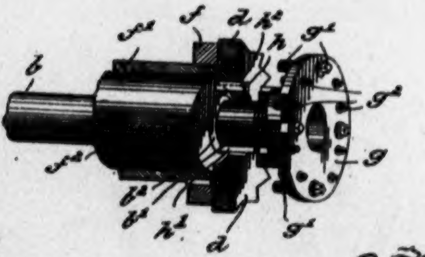
n
m1
m5
m2
m1
m2
e1
e6
e2
e4

Fig: 8.


f1
f
d
h2
h
g1
g1
g2
b
g
f2
b2
b1
h1
d
g1

Witnesses:
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UNITED STATES PATENT OFFICE.

EUGENE S. BRADFORD, OF PHILADELPHIA, PENNSYLVANIA.

MACHINE FOR MAKING EXPANDED METAL.

SPECIFICATION forming part of Letters Patent No. 664,879, dated December 25, 1900.

Application filed September 5, 1899. Serial No. 729,422. (No model.)

To all whom it may concern:

Be it known that I, EUGENE S. BRADFORD, a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Machines for Making Expanded Metal, of which the following is a specification.

My invention has relation to a machine adapted to form sheet metal into a reticulated or mesh-like structure, and in such connection it relates more particularly to the construction and arrangement of such a machine.

Heretofore in machines used for a similar purpose the sheet metal has been slit and expanded into the form desired either by subjecting it to the action of two converging series of rotary cutters and expanders or to the action of reciprocating knives.

The machine of my present invention differs essentially from preceding machines in that but a single series of rotary cutters and expanders is required, the metal being fed to these cutters or expanders at an angle.

The principal object of my invention is therefore to provide a machine for expanding metal, having but a single series of rotary expanding-cutters arranged in alinement, the sheet of metal being fed to these cutters at an angle to the plane in which the cutters rotate.

Further objects of my present invention are, first, to provide, in conjunction with the single series of expanding-cutters, a series of circular cutters, replacing the stationary or reciprocatory knives formerly used; second, to locate these circular cutters slightly in advance of the expanding-cutters, so that the circular cutter may act as a support for the metal during the shearing and expanding operations; third, to provide, in conjunction with the expanding-cutters and circular cutters, a feed-roller located eccentrically with respect to the shaft of each expanding-cutter, so as to be directly above the circular cutter and to assist said circular cutter in the feeding of the sheet; fourth, to provide each expanding-cutter with a holder which can be readily and quickly secured or removed from the shaft of the expanding-cutter by means of a single nut and to which holder the expanding-cutter is firmly secured; fifth, to provide set and binding screws by means of which the expanding-cutter may be adjusted on its holder toward or away from the face of the circular cutter; sixth, to provide an expanding-cutter, its shaft, and the holder for securing the cutter to said shaft with splines or keys, whereby the cutter when removed from the shaft may be replaced thereon to occupy the same relative position with respect to its expanding-prongs as it did prior to its removal from the shaft; seventh, to provide in such a machine a bed or table over which the metal is fed, said bed being provided with a series of transverse slots, wherein guide-rolls are adapted to be adjusted, said guide-rolls determining the relative angle at which the metal is to be presented to the cutters; eighth, to provide in such a machine means whereby the expanding-cutters and their shafts may be arranged eccentrically with respect to the feed-rollers on said shafts, so as to permit the feed-rollers to rotate directly above the lower circular cutters and the expanding-cutters to rotate a little beyond the circular cutters; ninth, to provide means for adjusting the shafts of the lower set of cutters transversely and vertically in the machine with respect to the frame, so as to compensate for wear and tear upon the cutters, as well as permit sheets of varying thickness to be cut, and, tenth, to provide adjacent to and in the rear of each expanding-cutter a stripping-roll adapted to prevent the expanded metal from buckling upward in the machine.

My invention, stated in general terms, consists of a machine for expanding metal constructed and arranged in substantially the manner hereinafter described and claimed.

The nature and scope of my invention will be more fully understood from the following description, taken in connection with the accompanying drawings, forming part hereof, in which—

Figure 1 is a front elevational view of a machine embodying the main features of my invention. Fig. 2 is a rear elevational view of the same. Fig. 3 is a horizontal sectional view taken on a plane directly above the lower or circular cutters. Fig. 4 is an elevational view of the feeding end of the machine,

The following drawings marked pp 519 to 524) a part of the feeding-table being removed. Fig. 5 is an enlarged transverse sectional view of Fig. 4. Fig. 6 is a vertical sectional view on the line 6 6 of Fig. 5. Fig. 7 is a similar view on the line 7 7 of Fig. 5. Fig. 8 is an enlarged perspective view, sectioned and partly broken away, of the expanding-cutter, its holder, and auxiliary parts. Figs. 9 and 10 are detail views illustrating the construction and arrangement of one of the guide-rolls. Fig. 11 is a diagrammatic view illustrating the manner in which the sheet metal is presented to the cutters. Fig. 12 is a front elevational view of the expanding-cutter and the circular cutter, illustrating the manner in which the meshes are formed in the sheet; and Fig. 13 is a perspective detail view of the adjustable bearing-block for the shaft of one of the lower or circular cutters.

Referring to the drawings, *a* represents the base or support of the machine, upon which is supported the vertical frame a', in which the various shafts of the machine are supported. From the vertical frame a' projects the lateral extension a^2, which forms the feeding-bed of the machine. From the top of the vertical frame a' extends an arched framework a^3, which forms an auxiliary support for the shafts *b* and accessories carrying the expanding-cutters *d*. The expanding-cutters *d* are all arranged in alinement at the front of the machine, as illustrated in Figs. 1 and 4, and the sheet of metal A is fed from a feeding-table a^4 by means of two feed-rolls a^5 to the feeding-bed a^2 and is presented to the action of the expanding-cutters *d* at an angle more or less acute, as desired.

In Fig. 11 the feeding of the sheet A to the cutters is illustrated in diagram. In conjunction with the expanding-cutters *d* at the front of the machine is located a series of circular cutters *e*, having their shafts e' arranged below the feeding-bed a^2 slightly in advance of the shafts *b*, carrying the expanding-cutters *d*, as clearly illustrated in Figs. 1, 6, 7, and 12. The periphery of each cutter *e* thus serves as a support for the sheet during the expanding and shearing of the same by the expanding-cutters *d*.

The cutting and expanding of the metal is accomplished in the following manner: The expanding-cutter *d* is in the form of a star having expanding-prongs d'. The inner face of each prong acting in conjunction with the outer face of each circular cutter *e* serves to shear or slit the sheet A. The prongs d' then expand the portion slit to form the meshes A', as clearly illustrated in Fig. 12. In conjunction with the periphery of each circular cutter the metal is supported or clamped and continuously fed by a feed-roller *f*, which rotates eccentrically with respect to the shaft *b* of each expanding-cutter *d* and directly above the periphery of each circular cutter *e*. The axes of the feed-rollers *f* and expanding-cutters *d* all lie in the same horizontal plane; but by reason of the eccentric relationship of each feed-roller to a shaft *b* of a corresponding expanding-cutter the feed-rollers rotate slightly in the rear of the expanding-cutters.

The preferred manner of arranging the feed-roller *f* with respect to the shaft *b* is illustrated in detail in Figs. 5, 6, 7, and 8 and is as follows: The frames a' and a^3 have tubular bearings, in which is adapted to rotate a sleeve f', carrying the feed-roller *f*. Within the sleeve f' is located a fixed cylindrical block f^2, upon which the sleeve f' is designed to rotate and within which is located eccentrically the shaft *b*, which rotates upon the block f^2 as a bearing. The block f^2 is clamped, by means of collars f^3 f^3, to a portion of the arched frame a^3, so as to prevent its turning in said frame. The expanding-cutter *d* is preferably not secured directly to the shaft *b*, but is carried by a holder or cap *g*. This cap *g* has a central orifice and is adapted to slip over the projecting screw-threaded end b' of the shaft *b* until it fits against a collar b^2 of said shaft. A nut b^3 serves to clamp the cap *g* down upon the collar, as clearly illustrated in Figs. 5 and 8.

The star-cutter *d* is secured to the cap or holder *g* in the following preferred manner: A series of set-screws g^2 are adapted to advance the cutter *d* from the cap *g* toward the lower or circular cutter *e* until the inner periphery of the expanding-cutter *d* is at the prescribed distance away from the outer periphery of the lower or circular cutter *e* to permit of a clear shearing or cutting of the sheet. A series of binding-screws g' serve to lock the expanding-cutter *d* against the force of the set-screws g^2, and thus prevent accidental loosening of said expanding-cutter *d*.

In arranging the star or expanding cutters *d* in alinement, as illustrated in Fig. 1, the prongs d' of the various cutters do not occupy the same relative position with respect to the axis of the lower cutters *e*. Thus, beginning at the left of Fig. 1, it will be observed that the first cutter *d* has its expanding-prong d' slightly in the rear of the axis of its complemental lower cutter *e*, whereas the next expanding-cutter *d* is turned so that its prong d' is almost directly in line with said axis. This alternate arrangement is followed throughout the series of expanding-cutters *d*. The reason for this arrangement is obvious. In the formation of the meshes A' in the sheet A each alternate row of half-meshes (see Fig. 12) is cut by alternate cutters *d*, and the points A^2 of expansion of the meshes A' will therefore not be in the same line in adjacent rows, but will fall in the same line in alternate rows. This results in the formation of diamond-shaped meshes, as clearly illustrated in Fig. 12. When now for any reason a star or expanding cutter *d* is to be removed from its shaft *b* and then replaced, it is necessary that when replaced its prongs shall occupy the same relative position as they did prior to the removal of the cutter from its shaft. A simple and efficient means for accomplishing this is illustrated in Figs. 5 and 8 and consists in preferably supplying the cap or holder g with two keys h and h', one of which, h, is adapted to enter a keyway h^2, formed in the cutter d, and the other, h', is adapted to enter a keyway h^3 in the shaft b.

Referring now to Figs. 3, 9, and 10, the preferred manner of guiding the sheet A on the bed a^2 is illustrated. In the bed a^2 is formed a series of transverse slots m, in which are adapted to slide the bolts m', each carrying at its upper end a flanged roll m^2, adapted, preferably, to turn upon a washer or sleeve m^3, surrounding the body of the bolt and interposed between its head m^4 and the clamping-nut m^5. The bolts m', with their guide-rolls m^2, are slid in the slots m until they are alined along the bed at the requisite angle to the edge of the bed a^2, and then they are clamped by the nuts m^5 and heads m^4, so as to prevent movement in the slots. It is to be understood that by shifting the bolts and guide-rolls along the slots the line of guide-rolls may be changed to make a more or less acute angle with the line of cutters d and e than the angle shown in the drawings.

In machines of this type the wear and tear upon the revolving cutters must be compensated for, and for this purpose the shafts e' are arranged in boxes e^2 and e^3, adapted to slide in bearings and to be adjusted up and down in said bearings by means of set-screws e^4. A preferred form of box is illustrated in Fig. 13, and its arrangement in the machine is shown at Fig. 5. To compensate for different thickness of metal to be cut and expanded, the cutters e and d should be adapted to be brought into more or less close relationship with each other, according to the thickness of the sheet. One way of accomplishing this is to give either shaft b or e' a transverse movement in the frame of the machine. In Fig. 5 the lower shaft e' is adapted to be thus shifted, and for this purpose one of the boxes e^3 is screw-threaded, as at e^{11}, to receive the collars e^5 and e^6, which when advanced on the box will serve to clamp the box to its bearing and when retracted will permit of the shifting of said shaft and box slightly in the bearing to occupy a required position, when the collars may again be tightened and the box locked in its new position. In the cutting and expanding of the sheet by means of an upper and lower rotary cutter the metal has a tendency to buckle upward in the machine. To prevent this and to assist in stripping the metal from the prongs of the expanding-cutters d, there is provided at the rear of each cutter d a stripping-roll n, suspended from the frame a^9 and rotating in a bracket n' in said frame. To properly feed and operate upon the metal, it is necessary that the star or expanding cutters d, the lower or circular cutters e, and the feed-rollers f shall all rotate in the same direction and at the same speed. To accomplish this, there is secured, as illustrated in Figs. 2 and 5, upon each shaft b a gear-wheel p, meshing with a drive gear-wheel p', to which motion is conveyed in any suitable manner from a source of power (not shown) by means of belts p^2. The gear-wheel p on shaft b meshes with a similar gear-wheel p^3 on the shaft e'. Motion is conveyed to the sleeve f', carrying the feed-rollers f, by securing a gear-wheel p^4 on said sleeve and meshing said gear-wheel p^4 with a similar gear-wheel p^5, carried by the shaft e', all as clearly illustrated in Fig. 5.

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a machine for expanding metal, a single series of rotary expanding-cutters arranged in alinement and means for feeding the metal at an angle to the plane in which said cutters rotate, substantially as and for the purposes described.

2. In a machine for expanding metal, a single series of rotary expanding-cutters arranged in alinement, a series of rotary circular cutters arranged below and coacting with the expanding-cutters, and means for feeding the metal at an angle to the plane in which the coacting cutters rotate, substantially as and for the purposes described.

3. In a machine for expanding metal, a single series of rotary expanding-cutters arranged in alinement and a series of rotary circular cutters arranged below and coacting with the expanding-cutters, the axes of said circular cutters being arranged slightly in advance of the axes of the expanding-cutters, substantially as and for the purposes described.

4. In a machine of the character described, a single series of rotary expanding-cutters arranged in alinement, a series of rotary circular cutters arranged below and coacting with the expanding-cutters, the axes of said circular cutters being arranged in advance of the axes of the expanding-cutters, and a series of feed-rollers arranged eccentrically on the axes of the expanding-cutters directly above the circular cutters and having their axes of rotation in line with the axes of rotation of the lower circular cutters, substantially as and for the purposes described.

5. In a machine of the character described, a cutter having a series of expanding-prongs, a cap or holder for said cutter, a series of binding-screws adapted to secure the cutter to the cap or holder, and a series of set-screws adapted to bear against the cutter to lock the same and to prevent accidental loosening of said cutter, substantially as and for the purposes described.

6. In a machine of the character described, an expanding-cutter, a shaft and a cap or holder for said cutter, said cap being provided with two keys, one of which is adapted to se-

cure the cutter to the holder and the other to secure the holder to the shaft, substantially as and for the purposes described.

7. In a machine of the character described, a single series of rotary expanding-cutters arranged in alinement, a feeding-bed above which the expanding-cutters rotate and provided with a series of transverse slots, a single series of rotary circular cutters arranged below and coacting with the expanding-cutters, and a series of guide-rolls adapted to be adjusted in the slots of the bed, to constitute a means for feeding the metal at an angle to the plane in which the coacting cutters rotate, substantially as and for the purposes described.

8. In a machine of the character described, an expanding-cutter, a shaft carrying said cutter, a cylindrical bearing-block in which said shaft is eccentrically located, a sleeve adapted to rotate upon the exterior of said block, and a feed-roller carried by said sleeve, substantially as and for the purposes described.

9. In a machine of the character described, a single series of expanding-cutters and their shafts, a single series of circular cutters coacting with said expanding-cutters and having their shafts arranged below the expanding-cutters and shafts, means for feeding the metal in the direction of rotation of said coacting cutters and means for feeding said metal at an angle to the plane of rotation of said coacting cutters, substantially as and for the purposes described.

In testimony whereof I have hereunto set my signature in the presence of two subscribing witnesses.

EUGENE S. BRADFORD.

Witnesses:

J. WALTER DOUGLASS,
THOMAS M. SMITH.

529 And afterwards, towit: on the 2nd day of January, A. D. 1908, an appearance was filed in said cause clothed in the words and figures following, towit:

United States Circuit Court of Appeals for the Sixth Circuit.

No. 1783.

THE EXPANDED METAL COMPANY
vs.
THE GENERAL FIREPROOFING CO.

Frank O. Loveland, Clerk of said Court:

Please enter my appearance as counsel for the Appellant.
(Signed.) ERNEST HOWARD HUNTER,
724-727 *New York Life Bldg.,*
1011 *Chestnut Street, Philadelphia.*

And afterwards, towit: on the fourth day of June A. D. 1908, an entry was made on the Journal of said Court clothed in the words and figures following, towit:

530 No. 1783.

THE EXPANDED METAL COMPANY
vs.
THE GENERAL FIREPROOFING CO.

This cause is argued in part by Mr. Ernest Howard Hunter for the Appellant and is continued until tomorrow for further argument.

And afterwards, towit: on the fifth day of June A. D. 1908, an entry was made on the Journal of said Court clothed in the words and figures following, towit:

THE EXPANDED METAL COMPANY
vs.
THE GENERAL FIREPROOFING CO.

This cause is further argued by Mr. Ernest Howard Hunter for the Appellant and by Mr. George H. Christy and Mr. Thomas W. Bakewell for the Appellee and is submitted to the Court.

And afterwards, towit: on the Sixth day of October, A. D. 1908, a decree was entered in said cause clothed in the words and figures following, towit:

531 United States Circuit Court of Appeals for the Sixth District.

No. 1783.

THE EXPANDED METAL COMPANY
vs.
THE GENERAL FIREPROOFING CO.

Appeal from the Circuit Court of the United States for the Northern District of Ohio.

This cause came on to be heard on the transcript of the record from the Circuit Court of the United States for the Northern District of Ohio, and was argued by counsel.

On consideration whereof, It is now here ordered, adjudged and decreed by this Court, that the decree of the said Circuit Court, in this cause be and the same is hereby reversed with costs and the cause is remanded to the said Circuit Court with directions to enter a decree for the plaintiff for an injunction and a reference to a master to ascertain the damages and profits and a final decree thereon.

532 And afterwards, towit: on the —— day of ——, A. D. 1908, an opinion was filed in said cause clothed in the words and figures following, towit:

Opinion.

533 Filed Oct. 16, 1908. Frank O. Loveland, Clerk.

Opinion 1783.

United States Circuit Court of Appeals, Sixth Circuit.

THE EXPANDED METAL COMPANY, Appellant,
v.
THE GENERAL FIREPROOFING COMPANY, Appellee.

Appeal from the Circuit Court of the United States for the Northern District of Ohio.

Submitted June 5, 1908; Decided October 6, 1908.

Before Lurton, Severens and Richards, Circuit Judges.

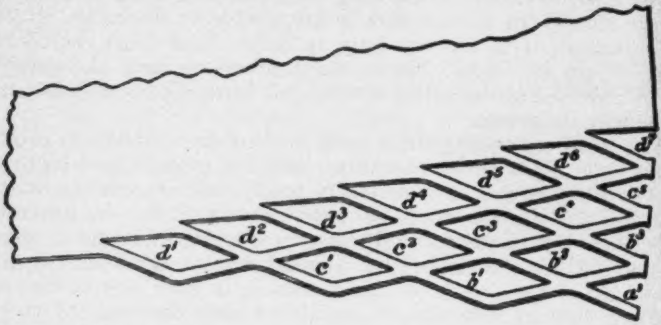
SEVERENS, Circuit Judge, delivered the opinion of the court:

This is a suit brought by the owner of Letters Patent No. 527,242, granted October 9, 1894, to John F. Golding, for a "Method of Making Expanded Sheet Metal," complaining of the infringement thereof by the defendant. In the court below the patent was held to be invalid upon the grounds stated by the Circuit Court of Appeals for the Third Circuit in its opinion in the case of *Bradford v. The Expanded Metal Company,* the complainant here, reported in 146 Fed., 984.

On this appeal much reliance is placed by the appellee upon the decision in that case, and rightly so, for this court would be strongly inclined to follow a decision of that learned court, if made of the same questions and upon the same record as presented in the case before us. The question of the validity of the patent, is the same; but we have no means of knowing what evidence was adduced in the case in the Third Circuit and so are unable to determine to what
extent, if at all, our duty to follow that court should con-
534 strain us. At all events, our impressions upon the questions
involved are so strong that we feel compelled to express an independent judgment.

The art of expanding sheet metal had made considerable progress at the date of Golding's invention; and the product had been used for various purposes, such as lattice work, trellises, screens, fencing, lath and the reinforcement of concrete structures. In general, it may be said, it consisted of slitting sheet metal into narrow strands by making more or less short, parallel slits of equal length along the length of the sheet alternately, that is, in such way as that each alternate line of slits should equally overlap the ends of the adjacent slits in the first line of slits and so on until the sheet was slitted. The sheet was then stretched laterally, the result being that the slitted strands and the uncut portions between them formed diamond-shaped meshes of nearly equal size and shape, but not of the desired uniformity, owing, doubtless, in large measure, to the variations in the thickness and texture of the sheet of metal. The sheet was shortened somewhat, but made much wider. This method had been improved upon, and notably by an invention of Golding and Durkee, patented by Letters No. 320,242, dated June 16, 1885. We shall not stop to enter into a further description of other earlier methods, which were the subjects of patents in this and other countries, for the reason that it sufficiently appears that the Golding and Durkee invention just mentioned was the most advanced and had proved the most successful at the date of the invention, which is the subject of the patent in suit. It seems desirable to describe the Golding and Durkee invention, patented in 1885, as we think it is the proper datum from which to reckon the novelty and utility of the subsequent invention of the Golding patent involved in the present suit. It consisted in "beginning at one side and corner and making an incision within the side of the metal, thus forming a strand which is simultaneously pressed away from the plane of the metal in a direction at or near a right angle, the position the stand assumes depending upon the distance it is moved from the plane of the
metal. *a'* in the drawing shows the first cut made. The next
535 step in this process is to make additional incisions, as is
shown at b^1, b^2 and b^3 in the figure here attached, further within the plate of metal, and leaving uncut sections at the ends of the cuts, and simultaneously with the cutting, the strands are pressed

away from the plane of the metal at the angle and to the desired position, as above described. Thus, each row of meshes is simultaneously cut and formed from a blank piece of metal without buckling or crimping the blank. In the act of cutting and forming the meshes, the finished article is contracted in a line with the cuts or incisions, and consequently it is shorter in this direction than the piece from which it was cut, but is greatly lengthened in a line at an angle to the plane of the original sheet plate or blank."



It is material to the purpose to observe (what will presently be seen) that by this method the strands are not strained by lengthening them, or if so, not beyond what is incident to the slitting and crowding them out. On the contrary, the strands, when cut and crowded out, pull all their attachments near and far (or so far as the already cut parts of the blank extend) and is the cause of the shortening of the sheet; and as the slitting and forming of the several meshes is going on at the same time, it is obvious that with all the severed parts exposed to the strain of the operation, irregularities in the result from buckling and crinkling in the severed parts would probably occur. And the testimony shows that this was the result manifested by the process in operation. The sheet of metal was somewhat contorted and materially shortened.

536 The object of Golding's present invention was to so order the process of slitting and bending the strands to their place as to prevent the distortion of the sheet and preserve its length and the regularity of its outline and of its meshes. To do this, he proposed to avail himself, as he says, of the capacity of the metal to lengthen and be bent under strain without materially impairing its strength. The method he proposes is this: He begins near one corner of the sheet and cuts a straight line of slits of equal length and distance apart near the edge of the sheet and along its length, and simultaneously with the cutting of each slit, bending off and down the several strands into the form of one-half of a diamond-shaped mesh. He then repeats the same operation by slitting a line of slits parallel to the first, except that the middle of the length of each of his slits will be made opposite the space left uncut in the first operation, and simultaneously with the second slitting, each

severed strand is turned off and down to form the other half of the diamond-shaped mesh. By a continuation of this process the whole sheet is expanded without shortening and in regularly shaped meshes. The advantages of this process are obvious. They result from the circumstance that every time a slit is made and the strand bent to the required form, the ends of the strand are supported and held in place by the whole of the uncut sheet. The cutting off and bending down of each strand is entirely independent of any other operation and the maintenance of the length of the sheet is preserved by keeping the body of it entire while the strands are each being cut off and bent. It appears from the testimony of experts that the expansion of metal by stretching it does not, within moderate limits, weaken its tensile strength, though it has a tendency to make it more brittle, but not injuriously, if not carried too far. The utility of this method of expanding the metal is sufficiently proven.

Figure 1 of the drawings, reduced in size, illustrates the sheet partly expanded by the process, or method, above explained.

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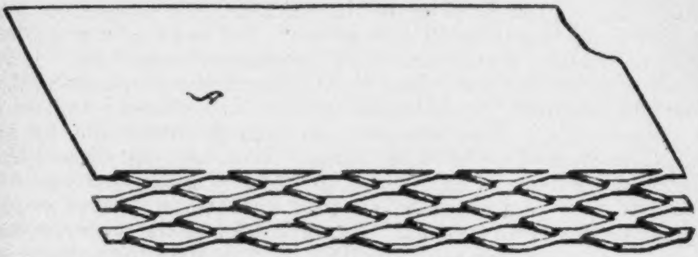

The claim reads as follows:

"I claim the herein described method of making open or reticulated metal work, which consists in simultaneously slitting and bending portions of a plate or sheet of metal in such manner as to stretch or elongate the bars connecting the slit portions and body of the sheet or plate, and then similarly slitting and bending in places alternate to the first mentioned portions, thus producing the finished expanded sheet metal of the same length as that of the original sheet or plate, substantially as described."

It seems even more simple than any method theretofore employed. It drew from the Circuit Court of Appeals for the Third Circuit the characterization of a "happy thought," and we think merited it. But that court felt constrained to reverse the decree of the lower court, which sustained the patent, because the conception of the thought was unaccompanied by any sufficient description of the means by which it might be realized. We cannot agree to this, especially in the face of the testimony on that subject in the present record.

If the specifications for a process patent do not sufficiently indicate to those skilled in the art to which it relates some means or instrumentalities by which it may be practiced, and the contrivance of

means for effecting it is beyond the skill of a trained mechanic, it might well be said that the inventor had not shown how to make his invention useful and therefore had not entitled himself to a patent. But here the inventor has gone on to point out that the slitting and
bending is to be done by a stationary cutter under the sheet,
538 and upper cutters to co-operate in shearing the slit. These
upper cutters are so constructed as to bend down the strand
to the proper distance. It is not stated just what the form shall be, but only ordinary skill in mechanics would suggest that the outer side of the cutter might be bevelled or a shoulder might be formed thereon to carry down the strand when severed.

Mechanism for the shifting of the sheet and of the knives was already in use in machines for expanding metal and, indeed, was common in the mechanical arts. Moreover, experts have here testified that these devices could be arranged by any skillful mechanic and we have no reason to doubt it.

Nor can we agree to the suggestion that the patent was for the function only of a machine. No doubt the function or principle of a machine cannot be the subject of a patent. It is not a distinct entity, but a mere property of the machine, and inseparable from it, and is developed by its normal use. But Golding was not here seeking to patent a machine, or the operation of a machine. It was a matter of indifference to him by what particular means his method could be practiced, but only that certain things should be done in a certain order. The apparatus he suggests would not by any known method of use be of any value. True, he could slit and bend sheets and strands of metal with it. That was the function of it. But still, until and unless he invented a specific method of use, his apparatus was of no account. The material and the apparatus were mere *disjecta membra* until the light of more than the ordinary intelligence pointed the way to the subjection of the one to the operation of the other to a useful purpose. We think the invention may rightly and aptly be characterized as an improvement in the art of expanding sheet metal, and is within the letter and spirit of the statute. To hold otherwise would be to adopt a rule which would operate to exclude from the benefits of the law many valuable inventions of things new and useful, and this, not by resting upon any exception found in the statute, but upon an artificial graft of error alien to its spirit and purpose. Several of the decisions of the Su-
preme Court are cited by Mr. Justice Brown in *Risdon Loco-*
539 *motive Works v. Medart,* 158 U. S., 68, which illustrate the
difference between the function, principle or operation of a
machine and the application of the function or principle in a peculiar and as yet unthought of way, and the discovery of the new mode of application of the principle conduces to a new and useful result. The cases of *Mowry v. Whitney,* 14 Wall., 620; *Cochrane v. Deener,* 94 U. S., 680, and *The Telephone Cases,* 126 U. S., 1, are examples in point. As we understand the case of *Risdon Locomotive Works v. Medart,* nothing is there decided which is in conflict with these views. Three patents were there under consideration. The first one considered was for a process in making belt pulleys. The other two were for belt pulleys. The last two were disposed of upon the

ground that the pulleys were not essentially different from former constructions, but were better only in the respect that they were the product of superior workmanship; and that part of the case may, for present purposes, be laid aside. With regard to the patent for a process, the court took the view that the invention was only of the result of the mechanism therein described. The opinion of the court was thereupon summed up as follows: "The result is a pulley more perfectly balanced, more faultless in shape, stronger and more durable, perhaps, than any other before produced; but this was not because the patentee had discovered anything new in the result produced, but because the mechanism was better adapted to produce that result than anything that had been before known. As pulleys of that description had been produced before, doubtless with greater care in the manufacture of them, a pulley as perfect as his might have been made. The operation or function of such machine, however, is not patentable as a process." The vital differences between such an invention and this are, that in this a new and different result is produced, a difference so great as to supplant all previous results; the mechanism by which it is produced is not new, that is, not patentably new; but the manner of its use is new, and the result is not produced simply by superior workmanship. That degree of
workmanship which existed in the art had not been equal
540 during the many years of the previous manufacture of ex-
panded metal to the discovery of the method of producing it
which Golding devised.

We are of opinion, therefore, that the patent should be sustained. The infringement of it is scarcely denied and we have no doubt on that subject. The decree will be reversed, with costs, with directions to enter a decree for the complainant for an injunction and for the profits and damages to be ascertained.

541 United States Circuit Court of Appeals for the Sixth Circuit.

I, Frank O. Loveland, Clerk of the United States Circuit Court of Appeals for the Sixth Circuit, do hereby certify that the foregoing is a true and correct copy of the record and proceedings in the case of The Expanded Metal Co. *vs.* The General Fireproofing Co. No. 1783, as the same remains upon the files and records of said United States Circuit Court of Appeals for the Sixth Circuit, and of the whole thereof.

In testimony whereof, I have hereunto subscribed my name, and affixed the seal of said Court, at the City of Cincinnati, Ohio, this 16th day of October, A. D. 1908.

[Seal United States Circuit Court of Appeals, Sixth Circuit.]

FRANK O. LOVELAND,
Clerk of the United States Circuit Court of
Appeals for the Sixth Circuit.

542 UNITED STATES OF AMERICA, *ss:*

[Seal of the Supreme Court of the United States.]

The President of the United States of America to the Honorable the Judges of the United States Circuit Court of Appeals for the Sixth Circuit, Greeting:

Being informed that there is now pending before you a suit in which The Expanded Metal Company is appellant and the General Fireproofing Company is appellee, which suit was removed into the said Circuit Court of Appeals by virtue of an appeal from the Circuit Court of the United States for the Northern District of Ohio, and we, being willing for certain reasons that the said cause and the record and proceedings therein should be certified by the said Cir-
cuit Court of Appeals and removed into the Supreme Court
543 of the United States, do hereby command you that you send
without delay to the said Supreme Court, as aforesaid, the
record and proceedings in said cause, so that the said Supreme Court may act thereon as of right and according to law ought to be done.

Witness the Honorable Melville W. Fuller, Chief Justice of the United States, the 17th day of November, in the year of our Lord one thousand nine hundred eight.

JAMES H. McKENNEY,
Clerk of the Supreme Court of the United States.

United States Circuit Court of Appeals for the Sixth Circuit, *ss.*

I, Frank O. Loveland, Clerk of the United States Circuit Court of Appeals for the Sixth Circuit, do hereby certify that the transcript of the record of the proceedings in this Court in the within entitled case heretofore certified by me for filing in the Supreme Court of the United States, was correct and complete as the same then appeared in this Court.

In pursuance of the command of the foregoing writ of certiorari I now hereby certify that on the 20th day of November, 1908, there was filed in my office a stipulation in the above entitled case in the following words, to-wit: "United States Circuit Court of Appeals, for the Sixth Circuit. Expanded Metal Company, Appellant, vs. The General Fireproofing Company, Appellee. Stipulation. A writ of certiorari in the above-entitled cause having been issued from and under the seal of the Supreme Court of the United States on the 17th of November, 1908, directing that the record and proceedings in the above-entitled cause be sent to the Supreme Court, it is now stipulated by and between counsel for the parties hereto that the certified copy of the transcript of record already filed in the Supreme Court of the United States with the petition for said writ of certiorari be treated as the return to the said writ of certiorari.

THOMAS W. BAKEWELL,
For Petitioner The General Fireproofing Co.
ERNEST HOWARD HUNTER,
The Respondent The Expanded Metal Co."

November 18th, 1908.

POOR COPY

I further certify that the above is a true and correct copy of said stipulation and of the whole thereof.

Witness my official signature and the seal of said United States Circuit Court of Appeals at the city of Cincinnati, Ohio, in said Circuit, this 20th day of November, 1908.

[Seal United States Circuit Court of Appeals, Sixth Circuit.]

FRANK O. LOVELAND,
Clerk U. S. Circuit Court of Appeals
for the Sixth Circuit.

544 [Endorsed:] File No. 21,402. Supreme Court of the United States. No. 606, October Term, 1908. The General Fireproofing Co. *vs.* The Expanded Metal Co. Writ of Certiorari. Filed Nov. 20, 1908. Frank O. Loveland, Clerk.

545 [Endorsed:] File No. 21,402. Supreme Court U. S. October Term, 1908. Term No. 606. The General Fireproofing Co., *vs.* The Expanded Metal Co. Writ of Certiorari and return. Filed Nov. 23d, 1908.